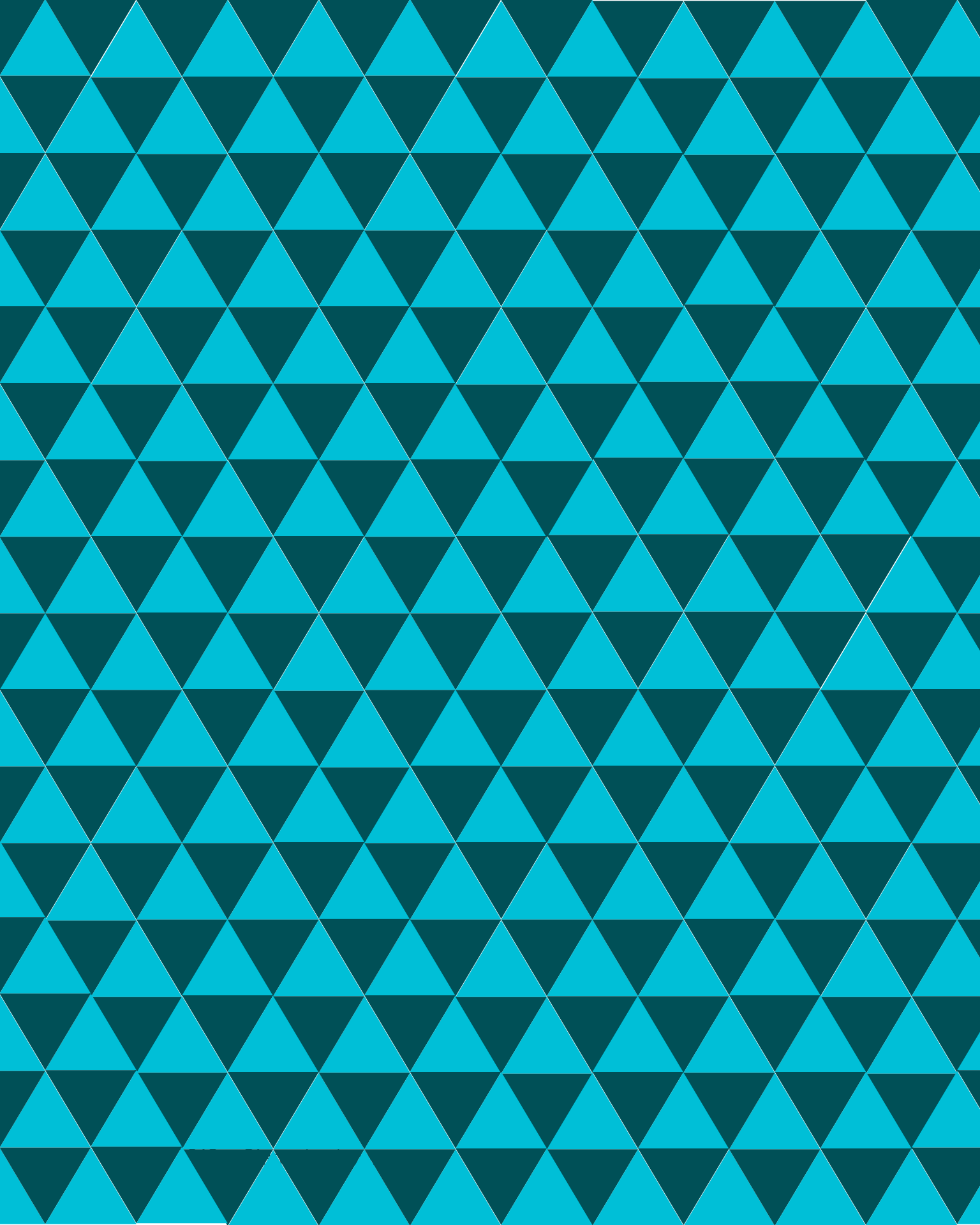
2019

GIANT JAMBOREE

Hynes Convention Center
October 31 - November 4
Boston



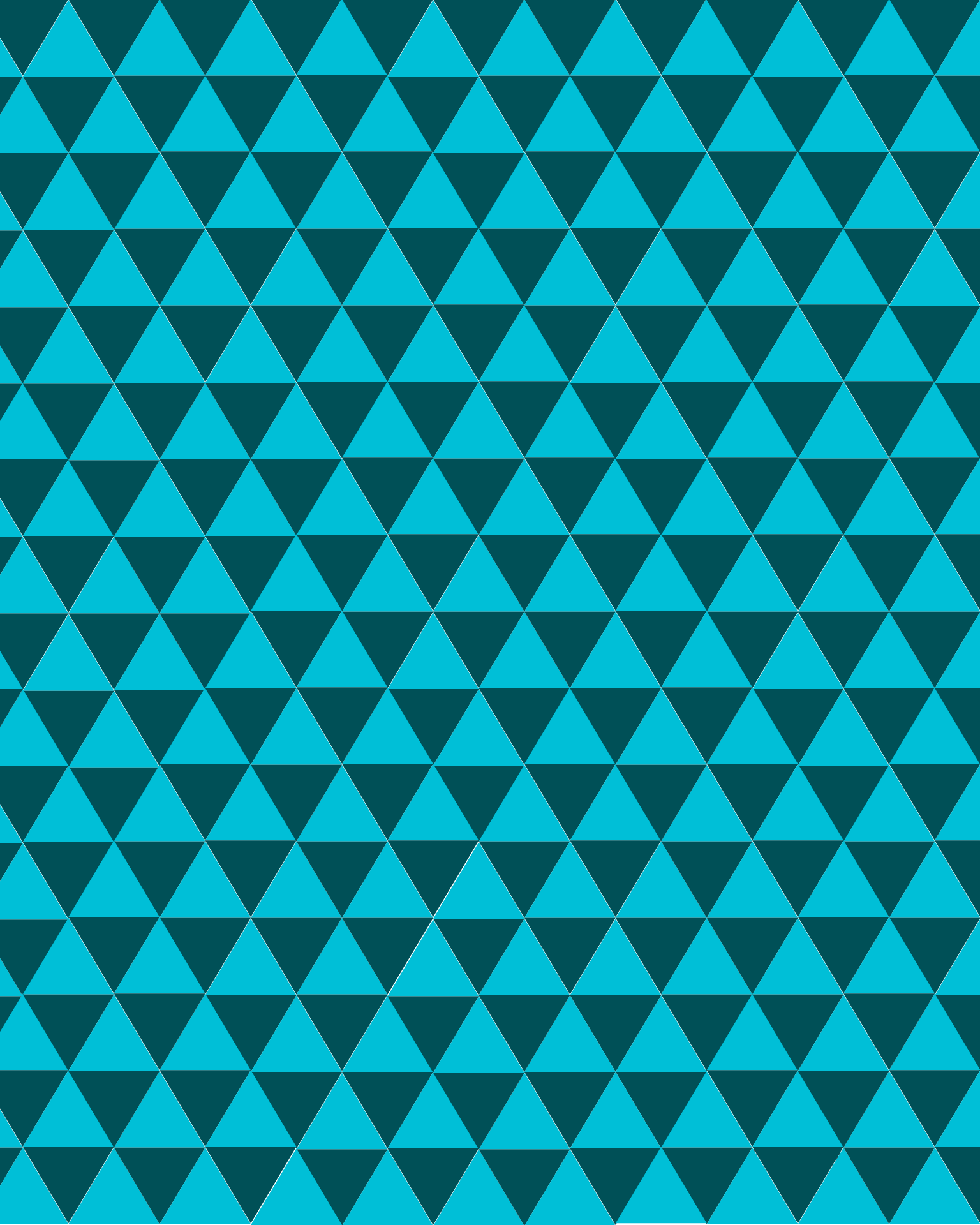


TABLE OF CONTENTS

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 2019, the iGEM Competition has expanded to more than 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 340 teams in Boston as they share, celebrate, and showcase their amazing work!

CONTRIBUTORS

iGEM Board of Directors

King Chow

Richard Johnson

Thomas Knight

Randy Rettberg

Pamela Silver

iGEM Foundation

Randy Rettberg
President

Meagan Lizarazo
Vice President

Maria Bartolini
Director of Marketing and Communications

Traci Haddock-Angelli
Director of the Competition

Piers Millet
Vice President of Safety and Security

Kitwa Ng
Assistant Director of Operations

Vinoo Selvarajah
Director of the Registry

Ana Sifuentes
Visual Designer and
Ambassador to Latin America

Abigail Sison
Laboratory Technician

Will Wright
Director of Entrepreneurship

Executive Judging Committee

Peter Carr
Director of Judging

Beth Beason-Abmayr

Janie Brennan

Nils-Christian Lübke

Jessica C. M. Tang

Christopher Workman

Patrick Wu

Responsible Conduct Committee

Peter Carr
Director of Judging

Chris French
Co-Chair

King Chow

Genya Dana

Karmella Haynes

Roman Jerala

Terry Johnson

Safety Committee

Piers Millet
Chair

Tessa Alexanian

Thomas Binz

David Brown

Brigitte Cadieux

Peter Carr

Teck Mean Chua

Genya Dana

Jacqueline van Engelen

Sam Weiss Evans

David Gillum

Anthony Holmes

Chris Isaac

Furqan Kabir

Alexander Kagansky

Tom Knight

Todd Kuiken

Kathleen Lehmann

Katherine Littler

Tiago Mendes

Vijayasmitha Moter

Kenneth Oye

Megan Palmer

Carolina Penalva-Arana

Jennifer Robertson

Larisa Rudenko

Paul Rutten

Janis Schleusner

Tim Trevan

Cecile van der Vlugt

Mathew Watson

Nicolas Willemarck

Samuel Yu

Weiwen Zhang

Kathryn Millett

Human Practices Committee

Megan Palmer
Chair

Todd Kuiken
Co-Chair

Executive Committee

Sam Weiss Evans

Kevin Chen

Joy Zhang

Tessa Alexanian

Pieter van Boheemen

Peter Carr

Piers Millett

Committee

Marguerite Benony

Hassnain Qasim Bokhari

Ellen Dias Jorgensen

Rahmat A. Kemal

Matthew Sample

Amy Weissenbach

Dorothy Zhang

Diversity and Inclusion Committee

Anne Meyer
Chair

Alyssa Henning
Co-Chair

Christina Agapakis

Christina Clodomir

Alba Iglesias Vilches

Landon Getz

Asal Golshaie

Louise Horsfall

Divya Israni

David Llyod

Darren Nesbeth

Peivand Sadat Mousavi

V. Anne. Smith

Brigette Vannier

Cibele Zolnier S. do Nascimento

SPONSORS

Platinum Partners

Partner Sponsors

Gold Sponsors

EXHIBITORS

Halls C and D

ABSA

After iGEM

Agilent Technologies

Arbor Bioscience

Batelle

Benchling

BioBricks Foundation

Cornell Alliance for Science

Diversity and Incusion Committee

FBI

Feles

GenScript

Ginkgo Bioworks

Human Practices Committee

Integrated DNA Technologies

MathWorks

Mesurement Committee

New England Biolabs

Opentrons

Promega

Revive and Restore

Synlogic

Twist Bioscience

USDA

Zymergen

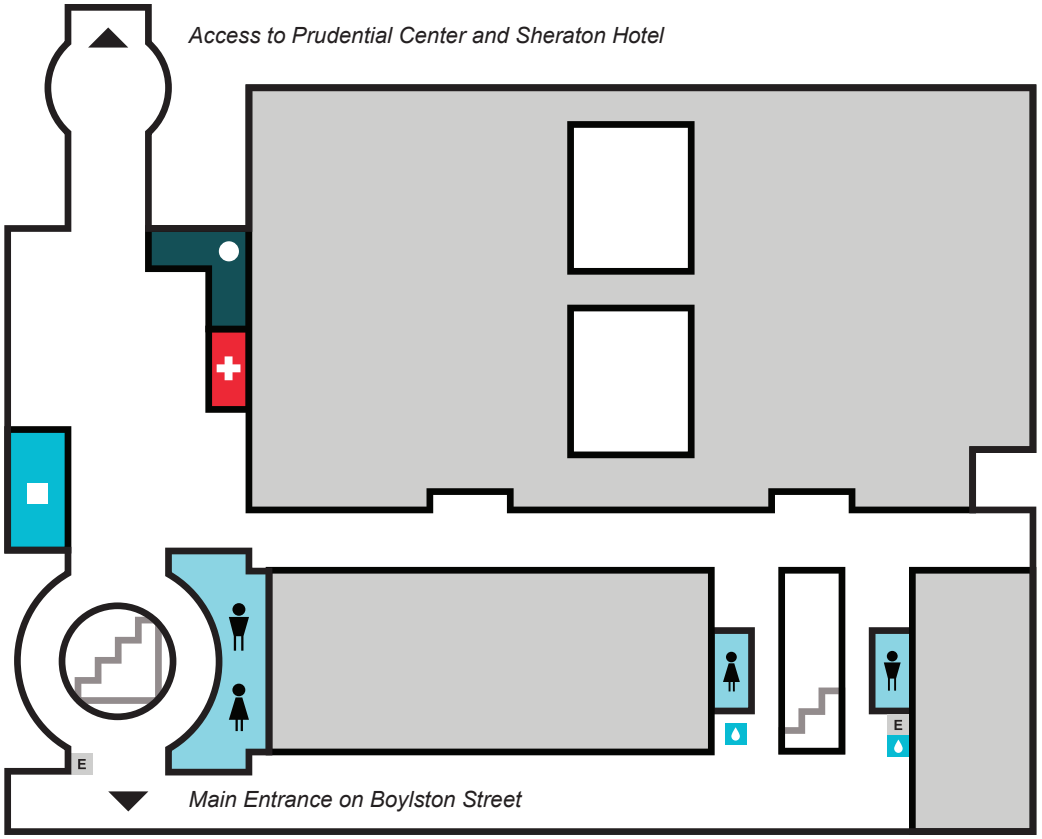
Career Fair

Saturday | Room 203 | 1:30-4:30pm | Hosted by iGEM

As part of the iGEM 2019 Giant Jamboree weekend, iGEM is hosting a career fair event on Saturday, November 2 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.
Companies:
- Twist Bioscience
- IDT
- GenScript
- FBI
- Synlogic
- Ginkgo Bioworks

MAPS

Plaza Level



Public Safety Office

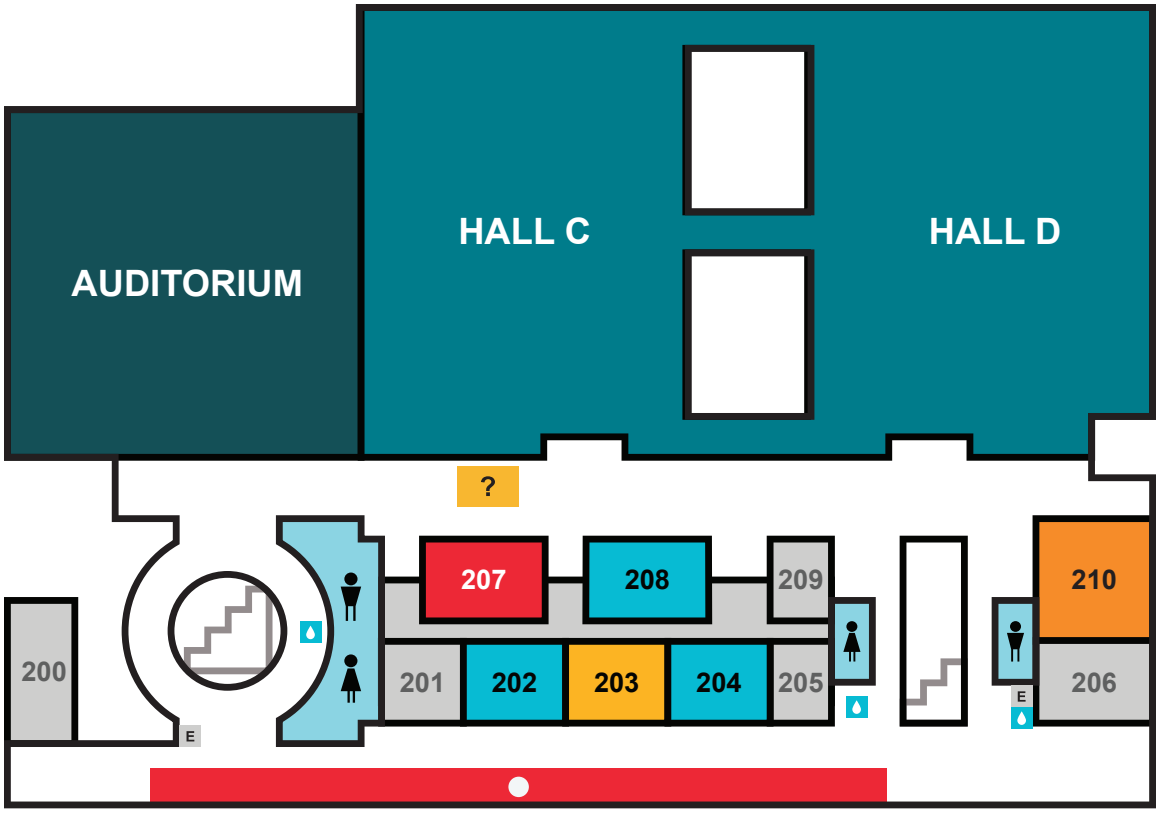
Business Center

First Aid

Water

E **Elevator**

Second Level



Rooms 202, 204 and 208
Workshops

Room 203
Career Fair

Room 207
IDT Suite

Room 210
Presentation Room

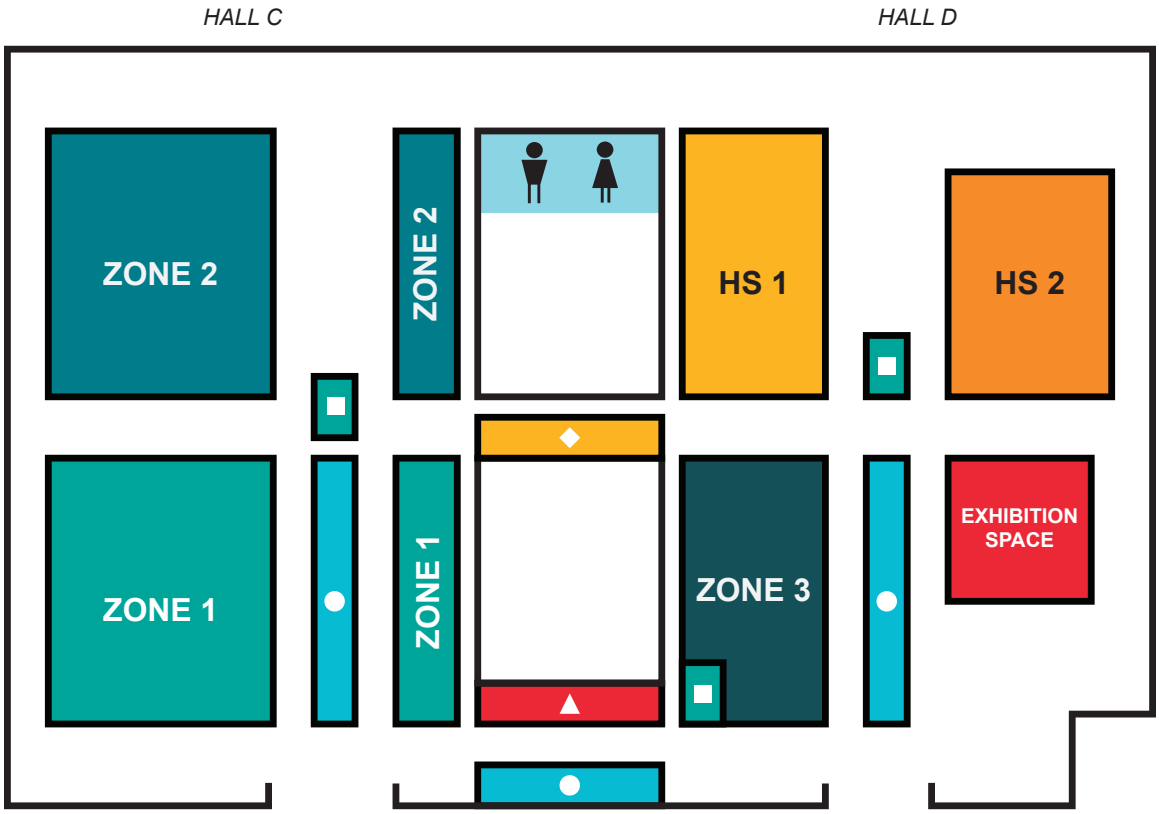
Water

E **Elevator**

? **HQ Desk**

Registration

Halls C and D



Poster Zone 1
1 - 110

Poster Zone 2
111 - 220

Poster Zone 3
221 - 271

Poster HS Zone 1
HS 1 - HS 44

Poster HS Zone 2
HS 45 - HS 74

Exhibition Space

Charging Station

Exhibitors

Graffiti Kiosk

iGEM Timeline

Third Floor

Rooms 302, 304, 306, 309, 310, 311, 312, 313, Ballroom A
Presentation Rooms

Room 301
Lactation Room

Room 308
Prayer/Quiet Room

Rooms 303, 305, 307
Extra Seating

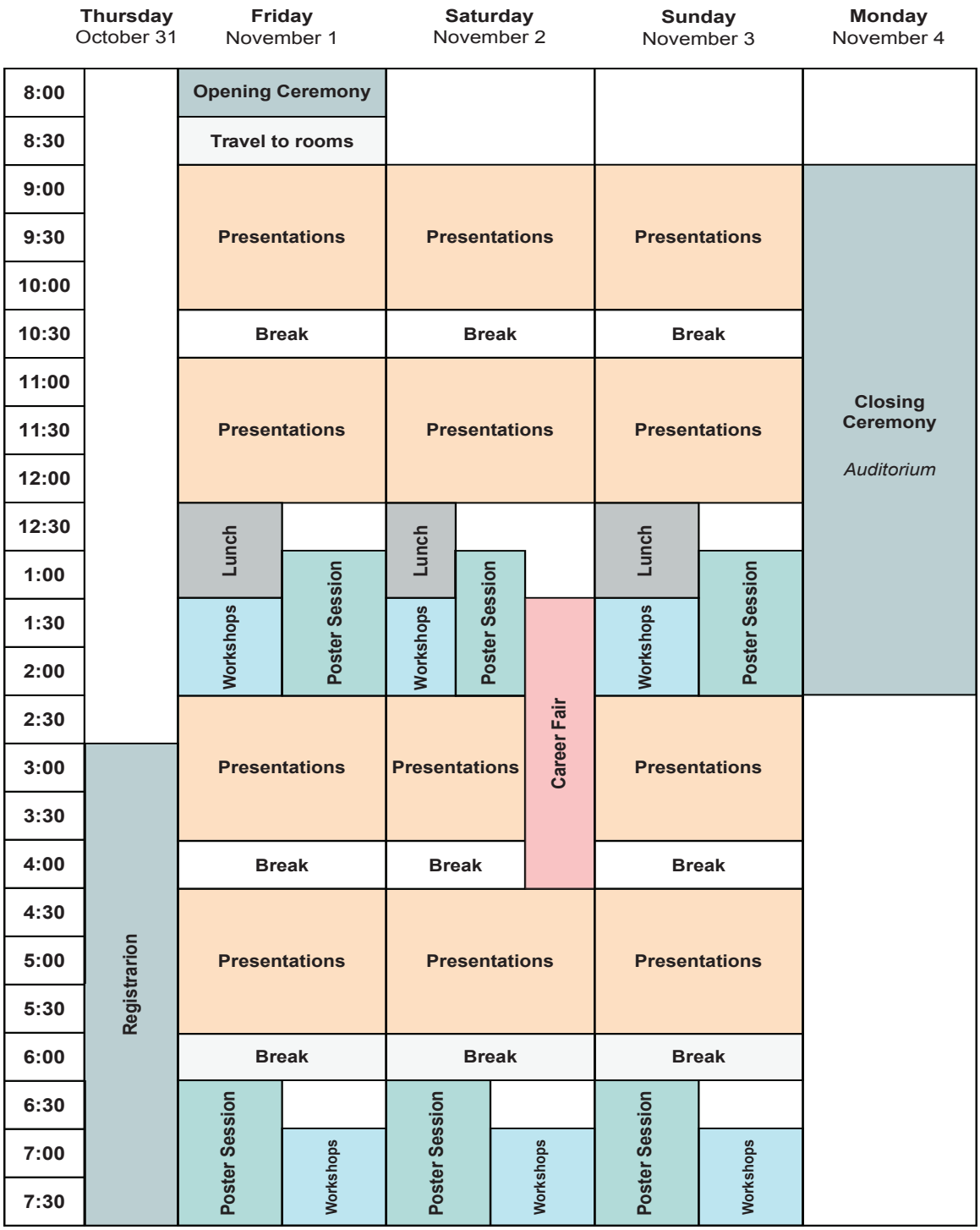
HQ Desk

Water

Elevator

Gender Neutral Bathrooms

SCHEDULE


Thursday October 31
Friday November 1
Saturday November 2
Sunday November 3
Monday November 4
8:00
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00
12:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
Opening Ceremony
Travel to rooms
Presentations
Break
Lunch
Workshops
Poster Session
Career Fair
Registrarion
Workshops
Closing Ceremony
Auditorium

Friday

Start Time	Room 210	Room 302	Room 304	Room 306	Room 309
8:00					Oper
8:30					Tra
9:00	GreatBay SZ	Vilnius-Lithuania	Bilkent-UNAMBG	USAFA	CSL Pittsburgh
9:30	XHD-WS-Wuhan-B	Marburg	NEU CHINA	Virginia	MADRID UCM HS
10:00	US AFRL CarrollHS	uOttawa	Jilin China	HBUT-China	KCL UK
10:30					
11:00	Thessaly	SYSU-CHINA	Tianjin	IISc-Bangalore	CU
11:30	Aboa	CSU Fort Collins	NTU-Singapore	NAU-CHINA	Orleans
12:00	Sriwijaya	SDU-Denmark	GIFU TOKAI	BIT-China	UIUC Illinois
12:30					
1:00	**Poster Session** Hall C and D *All Friday Teams*				
1:30			**Promega Workshop** Room 202	**Benchling Workshop** Room 208	
2:00					
2:30	MITADTBIO Pune	DUT China B	TAS Taipei	Bioriidl Somaiya	SHSSIP-CHINA
3:00	Chalmers-Gothenburg	NTHU Taiwan	CCA San Diego	Tufts	GDSYZX
3:30	RHIT	TokyoTech	Hong Kong JSS	Austin UTexas	SoundBio
4:00					
4:30	UANL	UI Indonesia	UZurich	Shanghai YGQ	IISER Kolkata
5:00	Toronto	SASTRA Thanjavur	WHU-China	Shanghai HS	TelHai-Migal Isra
5:30	Lubbock TTU	NWU-China	NYU Shanghai	Saint Joseph	NCKU Tainan
6:00					
6:30	**Poster Session** Hall C and D *All Friday Teams*				
7:00			**Latin America Meetup** Room 202	**High School Meetup** Room 204	
7:30					

	Room 310	Room 311	Room 312	Room 313	Ballroom A
ning Ceremony					
avel to rooms					
S	**UAAAN** **FAFU-CHINA** **Edinburgh UG**	**Navarra BG** **Jiangsu High School** **ACIBADEM ISTANBUL**	**KUAS Korea** **Guelph** **BOKU-Vienna**	**Technion-Israel** **Calgary** **UAlberta**	**UNSW Australia** **Evry Paris-Saclay** **Jiangnan-China**
Break					
	UCAS-China **Alma** **Oxford**	**Tec-Monterrey** **SDU CHINA** **BM-AMU**	**QDHS Shanghai** **XHD-WS-Wuhan-A** **Shanghai High School**	**Rice** **ITB Indonesia** **Cornell**	**HZNFHS Hangzhou** **PuiChing Macau** **SEFLS Shanghai**
Lunch					
	After iGEM Workshop Room 210	**Opentrons Workshop** Room 304	**Agilent Workshop** Room 306	**Ginkgo Bioworks Workshop** Room 312	
	USTC **KAIT JAPAN** **Western Canada**	**UC San Diego** **NAWI Graz** **Concordia-Montreal**	**VIT Vellore** **IIT-Madras** **Leiden**	**Alabama** **Sydney Australia** **Costa Rica**	**Penn** **Tsinghua-A** **UPRM**
Break					
el	**Duesseldorf** **Nottingham** **USTC-Software**	**Ionis Paris** **AHUT China** **Edinburgh OG**	**Gunma** **MIT** **St Andrews**	**Mingdao** **Shanghai City** **LACAS BioBots**	**BUCT-China** **UTArlingtonTexasUSA** **Sorbonne U Paris**
Break					
	iGEM Hackaton Room 208				

Saturday

Start Time	Room 210	Room 302	Room 304	Room 306	Room 309
9:00	Nanjing	Sao Carlos-Brazil	MichiganState	Tacoma RAINmakers	SUSTech Shenzh
9:30	BEAS China	SJTU-BioX-Shanghai	UM MMacau	Purdue	Fudan-TSI
10:00	ASIJ Tokyo	UA Huntsville	ITESO Guadalajara	Strasbourg	IISER-Pune-Indi
10:30					
11:00	BrockU	Aix-Marseille	Linkoping Sweden	UPNAvarra Spain	iBowu-China
11:30	BGU Israel	MADRID UCM	SYSU-Medicine	Kyoto	Korea HS
12:00	Harvard	CCU Taiwan	Hong Kong HKU	Waterloo	Auburn Alabam
12:30					
1:00	**Poster Session** Hall C and D *All Saturday Teams*				
1:30			**iGEM Committee Workshop** Room 202	**After iGEM Workshop** Room 204	**Twist Bioscienc Workshop** Room 208
2:00					
2:30	TU Darmstadt	SIS Korea	JiangnanU China	Amazonas-Brazil	Pasteur Paris
3:00	UC Davis	HK SSC	Manchester	TAU Israel	Rotterdam HR
3:30	Ruperto Carola	Nanjing High School	UniGE-Geneva	UNebraska-Lincoln	Queens Canada
4:00					
4:30	TU Dresden	CAU China	Johns Hopkins	ASTWS-China	NU Kazakhstan
5:00	Munich	SNU India	Canterbury Chch NZ	SDSZ China	Bonn
5:30	Northwestern	UESTC-China	Lund	HK GTC	IIT Chicago
6:00					
6:30	**Poster Session** Hall C and D *All Saturday Teams*				
7:00			**Human Practices Meetup** Room 202	**LGBTQ+ Meetup** Room 204	
7:30					

	Room 310	Room 311	Room 312	Room 313	Ballroom A
en a	AFCM-Egypt CU-Boulder ETH Zurich	CSMU Taiwan Grenoble-Alpes TU Eindhoven	Botchan Lab Tokyo Stony Brook Exeter	BSC United Xiamen City Lethbridge HS	Stanford Stuttgart FAU Erlangen
Break					
a	Potsdam Tongji Software UESTC-Software	OUC-China Bielefeld-CeBiTec Hong Kong HKUST	Shenzhen SFLS ShanghaiFLS China Hong Kong UCCKE	UCSC NYU New York ECUST China	BIT Aachen Nanjing-China
Lunch					
e	iGEM Committee Workshop Room 210	Promega Workshop Room 302	iGEM Committee Workshop Room 304	MathWorks Workshop Room 311	FBI Workshop Room 312
a	BHSF ND BNDS China SZTA Szeged HU	FSU NCTU Formosa Mines	SZU-China BrownStanfordPrinctn UChicago	Bulgaria ShanghaiTech China CPU CHINA	SEU Sheffield Missouri Miners
Break					
	ULaval Groningen Tsinghua	Aalto-Helsinki SCU-China HUST-China	Tuebingen NJTech China IISER Tirupati	Unimelb Thessaloniki Washington	GZHS-United Hangzhou WestLake TPHS San Diego
Break					

MathWorks Hackaton Room 208

Sunday

Start Time	Room 210	Room 302	Room 304	Room 306	
9:00	Gaston Day School	Florida	GENAS China	JNU-China	H
9:30	NCHU Taichung	DTU-Denmark	Shanghai-United	KU LEUVEN	Bio W
10:00	Warwick	NUS Singapore	Baltimore BioCrew	Poitiers	Worlds
10:30					
11:00	UCopenhagen	QHFZ-China	Richmond UR	BNU-China	N
11:30	CMUQ	East Chapel Hill HS	EPFL	SMMU-China	
12:00	ZJU-China	SUIS Shanghai	OhioState	YAU-China	IIS
12:30					
1:00	**Poster Session** Hall C and D *All Sunday Teams*				
1:30			**IDT Workshop** Room 208	**iGEM Workshop** Room 210	
2:00					
2:30	Shanghai HS United	USP SaoCarlos-Brazil	Peking	RDFZ-China	Brit
3:00	Worldshaper-Wuhan	WLC-Milwaukee	Tartu TUIT	Lambert GA	
3:30	RIS BKK	Wroclaw	NUDT CHINA	Nanjing NFLS	Hon
4:00					
4:30	UGA	Northern BC	XJTLU-CHINA	UFRGS Brazil	Will
5:00	Wageningen UR	Newcastle	UCL	Tec-Chihuahua	
5:30	SZPT-CHINA	XMU-China	TJUSLS China	Georgia State	
6:00					
6:30	**Poster Session** Hall C and D *All Sunday Teams*				
7:00			**CCiC Meetup** Room 204	**iGEM Hackaton** Room 208	
7:30					

Room 309	Room 310	Room 311	Room 312	Room 313
K SKHLPSS Without Borders shaper-Shanghai	Athens XJTU-CHINA DUT China A	Moscow TecMonterrey GDL NYU Abu Dhabi	Humboldt Berlin BUAP Mexico ZJUT-China	ULaVerne Collab Fudan NEFU China
Break				
YMU-Taipei Nantes SER Bhopal	Uppsala Universitet Tongji China Lethbridge	FDR-HB Peru KOREA Greatbay SCIE	Pittsburgh Montpellier REC-CHENNAI	HUBU-WUHAN Macquarie Australia Westminster UK
Lunch				
Genscript Workshop Room 302	**iGEM Committee Workshop** Room 306	**After iGEM Workshop** Room 311	**iGEM Workshop** Room 312	
tish Columbia Michigan g Kong-CUHK	Stockholm LZU-CHINA CSU CHINA	MSP-Maastricht SCUT China HZAU-China	UiOslo Norway Victoria Wellington SJTU-software	TU Kaiserslautern SEU-Nanjing-China Tunghai TAPG
liam and Mary Hamburg USP-Brazil	JNFLS Hong Kong LFC PC SHSBNU China	Freiburg GO Paris-Saclay TUDelft	Worldshaper-XSHS SBS NY DNHS SanDiego	
Break				

WORKSHOPS

All weekend

IDT Lounge	Room 207	All day
Build a Landmark	HQ Table	All day

Friday

Ready to turn your project into a business?	Room 202	1:30 PM - 2:30 PM
Designing, Recording, and Sharing Experiments with Benchling: A Workshop for iGEM Teams	Room 208	1:30 PM - 2:30 PM
How to Successfully Pitch Yourself in Industry & Academia	Room 210	1:30 PM - 2:30 PM
A Hands-on Introduction to Automating Your Protocols with the OT-2	Room 304	1:30 PM - 2:30 PM
SynBio Solutions	Room 306	1:30 PM - 2:30 PM
Making Biology Easier to Understand	Room 312	1:30 PM - 2:30 PM
Latin America Meetup	Room 202	7:00 PM - 8:00 PM
High School Team Meetup	Room 204	7:00 PM - 8:00 PM
Sustainable Development Goals Hackathon	Room 208	7:00 PM - 8:00 PM

Saturday

Empowering responsible and visionary engineering! Design the future of Human Practices	Room 202	1:30 PM - 2:30 PM
Career Fair	Room 203	1:30-4:30pm
The Mentorship Program 2019	Room 204	1:30 PM - 2:30 PM
Calling all synthetic biology innovators - can you be the hero the world needs?	Room 208	1:30 PM - 2:30 PM

LGBTQ+ in STEM: Stories, Data, and Strategies	Room 210	1:30 PM - 2:30 PM
What kinds of industry jobs could I get with my degree?	Room 302	1:30 PM - 2:30 PM
Measurement at iGEM	Room 304	1:30 PM - 2:30 PM
Modeling Synthetic Biology Systems with MATLAB and SimBiology	Room 311	1:30 PM - 2:30 PM
Safeguarding Science and the Future	Room 312	1:30 PM - 2:30 PM
Instructor and Judge Human Practice Meetup: Committee Feedback and Interest session	Room 202	7:00 PM - 8:00 PM
LGBTQ+ Meetup	Room 204	7:00 PM - 8:00 PM
Mini-Hackathon with MATLAB and SimBiology	Room 208	7:00 PM - 8:00 PM

Sunday

A Look Beyond the Giant Jamboree: Career Advice from IDT Associates	Room 208	1:30 PM - 2:30 PM
The Insight of Protein Engineering Shared by TED Fellow Christopher Bahl	Room 302	1:30 PM - 2:30 PM
Working Safely with Biology	Room 306	1:30 PM - 2:30 PM
After iGEM	Room 311	1:30 PM - 2:30 PM
Synthetic biology and NASA's Missions	Room 312	1:30 PM - 2:30 PM
CCiC Meetup	Room 204	7:00 PM - 8:00 PM
Software Tools for Synthetic Biology Workflows	Room 208	7:00 PM - 8:00 PM
Start-up Showcase	Room 210	8:00 PM - 9:00 PM

All weekend

IDT Lounge

Friday - Monday | Room 207 | All day | Hosted by IDT

Need a break to relax and recharge from the Giant Jamboree activities? Join us at the IDT lounge! 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!)

Build a Landmark

Friday - Sunday | HQ Table | All day | Hosted by iGEM

Looking for a hands-on activity to destress during the Jamboree? Stop by the iGEM HQ desk outside of Hall C 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.

Friday

Ready to turn your project into a business?

Friday | Room 202 | 1:30 PM - 2:30 PM | Hosted by Promega

Tom Livelli, Vice President of Life Sciences – Promega Corporation, started his first of multiple companies while studying at Columbia University. Tom sold his most recent startup to Invitrogen (now Thermo Fisher Scientific) and shifted his focus to building innovative programs, teams and technologies within established biotech companies to reinvigorate their scientific focus. Tom will share his story for how he developed the ideas and concepts for his companies through selling them as well as the differences between starting his own company versus working for an established company.

Designing, Recording, and Sharing Experiments with Benchling: A Workshop for iGEM Teams

Friday | Room 208 | 1:30 PM - 2:30 PM | Hosted by Benchling

Benchling is a data management platform built to help scientists design sequences, record notes and datasets, and collaborate on experiments. Rather than spend time searching across different software tools, paper, and spreadsheets for data and DNA sequences, iGEM teams using Benchling can spend time focusing on what they care about: science. In this interactive workshop, the Benchling team will demonstrate how Benchling's Molecular Biology design and analysis tools, integrated Notebook, and collaboration platform can help iGEM teams work more efficiently. Bring your laptops and we'll help you and your team get started on Benchling, walk through a molecular biology workflow, and share some of our favorite tips and tricks.

How to Successfully Pitch Yourself in Industry & Academia

Friday | Room 210 | 1:30 PM - 2:30 PM | Hosted by After iGEM

This workshop aims to highlight the similarities and differences between job hunting in academia and industry, emphasise the relevant skills and expertise in each of them, and aid with the communication and preparation of documents (CV, statement of purpose, cover letter) oriented towards the specific context.
- Discussion on the CV and motivation/cover letter content oriented to academic vs industry environments
- Contacting Managers vs Principal Investigators to address open positions - importance of choosing emails vs phone calls

A Hands-on Introduction to Automating Your Protocols with the OT-2

Friday | Room 304 | 1:30 PM - 2:30 PM | Hosted by Opentrons

In this workshop you will learn how to create and run an automated protocol on the Opentrons OT-2 liquid handling robot. We'll cover a general introduction to the Opentrons platform for new users and share tips and tricks for using our new Protocol Designer tool, as well as our Python API for more experienced users. Come with your laptops and bring your questions for the Opentrons team!

SynBio Solutions

Friday | Room 306 | 1:30 PM - 2:30 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!

Making Biology Easier to Understand

Friday | Room 312 | 1:30 PM - 2:30 PM | Hosted by Ginkgo Bioworks

At Ginkgo Bioworks, our mission is to make biology easier to engineer, but how do we make it easier to understand? Come spend time with Ginkgo's Creative Team to discuss how to start conversations about GMOs, craft stories around science, and visually communicate the complexities of biology.

Latin America Meetup

Friday | Room 202 | 7:00 PM - 8:00 PM | Hosted by After iGEM

Latin America teams, come meet other teams from your region! Teams can share their experiences with one another and network. This session is open to everyone.

High School Team Meetup

Friday | Room 204 | 7:00 PM - 8:00 PM | Hosted by After iGEM

High school team members and advisors, 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!

Sustainable Development Goals Hackathon

Friday | Room 208 | 7:00 PM - 8:00 PM | Hosted by iGEM

Have you ever wondered what you could do to help tackle some of the climate challenges of our times? Come and join After iGEM to see how you could use your technical and entrepreneurial skills to help us reach the sustainable development goals and take action on creating a sustainable future! Join this challenge where teams compete to develop best solutions to one of the 17 UN sustainability goals using design thinking and team work.

Saturday

Empowering responsible and visionary engineering! Design the future of Human Practices

Saturday | Room 202 | 1:30 PM - 2:30 PM | Hosted by

In this special session, the Human Practices committee invites you to share your adventures, successes, failures and ideas about Human Practices and to help create the future of Human Practices at iGEM. We're here to bring teams together, exchange stories, and build a vision to enable more responsible and impactful projects and initiatives.

The Mentorship Program 2019

Saturday | Room 204 | 1:30 PM - 2:30 PM | Hosted by After iGEM

The Mentorship Program for 2019 involved 48 teams and 33 mentors from 26 countries. With a newly formed committee running the program this year, many new ideas have formed regarding improvements in educational resources, communication tools, and quantifying the impact of the program. The workshop we want to run will invite mentors, mentees, and those interested to provide us in-person feedback about how the 2019 competition went, and feedback on our ideas so we can design and implement them more effectively.

Calling all synthetic biology innovators - can you be the hero the world needs?

Saturday | Room 208 | 1:30 PM - 2:30 PM | Hosted by Twist Bioscience

Design and build a synthetic biology solution to an unusual problem. Come and work with other iGEMers to use your creativity and synbio engineering skills to solve a science fiction dilemma. Best solution wins a prize!

LGBTQ+ in STEM: Stories, Data, and Strategies

Saturday | Room 210 | 1:30 PM - 2:30 PM | Hosted by iGEM Diversity and Inclusion Committee

LGBTQ+ (lesbian, gay, bisexual, transgender, and queer) people in STEM (science, technology, engineering, and mathematics) fields face a number of issues related to diversity, equity, and inclusion. This workshop will explore personal stories, the little data that does exist on LGBTQ+ experiences in STEM, and what we can do to make STEM a more welcoming and inclusive space for members of the LGBTQ+ community.

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

Saturday | Room 302 | 1:30 PM - 2:30 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. 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.

Measurement at iGEM

Saturday | Room 304 | 1:30 PM - 2:30 PM | Hosted by iGEM Measurement Committee

Join the iGEM Measurement Committee to discuss the state of measurement in iGEM! We will talk about what the committee has been up to this year and want to get input from teams on what's working for you, what you'd like more help with, and plans for the future.

Modeling Synthetic Biology Systems with MATLAB and SimBiology

Saturday | Room 311 | 1:30 PM - 2:30 PM | Hosted by MathWorks

Mathematical modelling guides the 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.

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

Safeguarding Science and the Future

Saturday | Room 312 | 1:30 PM - 2:30 PM | Hosted by 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.

Career Fair

Saturday | Room 203 | 1:30-4:30pm | Hosted by iGEM

As part of the iGEM 2019 Giant Jamboree weekend, iGEM is hosting a career fair event on Saturday, November 2 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.
Companies:
- Twist Bioscience
- IDT
- GenScript
- FBI
- Synlogic
- Ginkgo Bioworks

Instructor and Judge Human Practice Meetup: Committee Feedback and Interest session

Saturday | Room 202 | 7:00 PM - 8:00 PM | Hosted by iGEM Human Practices Committee

Interested in joining the HP committee? Have suggestions on how to make HP better from an instructor or judge perspective? Please join us!

LGBTQ+ Meetup

Saturday | Room 204 | 7:00 PM - 8:00 PM | Hosted by iGEM Diversity and Inclusion Committee

Lesbian, gay, bisexual, transgender, and queer iGEM students and advisors, please join us for a casual meet-up event! Meet new friends from around the world for fun, networking, and relaxing.

Mini-Hackathon with MATLAB and SimBiology

Saturday | Room 208 | 7:00 PM - 8:00 PM | Hosted by MathWorks

Join this mini-hackathon to solve a synthetic biology challenge using MATLAB and SimBiology. Participants are advised to attend MATLAB and SimBiology workshop earlier in the day to get an overview and to get familiar with the tools. Hackathon participants need to bring a laptop with MATLAB and SimBiology installed. If you haven't already done so, you can request free MATLAB here: https://www.mathworks.com/academia/student-competitions/igem.html Participation is limited to 10 teams. Teams will be selected on a first come first basis. The first team to complete the challenge will win a prize.

Sunday

A Look Beyond the Giant Jamboree: Career Advice from IDT Associates

Sunday | Room 208 | 1:30 PM - 2:30 PM | Hosted by IDT

Join us for a panel discussion where you will have the opportunity to ask IDT associates about their career journeys. What led them to where they are now? What went well in their careers? If they had a chance to do it all over again, what would they do differently? Associates from backgrounds in biology, engineering, and marketing will share their stories and provide both a glance into the industry and options after college.

The Insight of Protein Engineering Shared by TED Fellow Christopher Bahl

Sunday | Room 302 | 1:30 PM - 2:30 PM | Hosted by Genscript

MolecularCloud featured scientist Dr. Christopher Bahl, who's been selected as a TED Fellow 2019, will deliver a talk to iGEMers about his enthusiasm on research and how his pioneering work on protein design creating an innovative approach with the potential to tackle long-standing challenges in medicine and human health. Also, as a PI leading a protein research group, he will share his prospective and expectation to the Generation Z and his suggestions to the future researchers.

Working Safely with Biology

Sunday | Room 306 | 1:30 PM - 2:30 PM | Hosted by iGEM Safety and Security Committee

We all think we are working safely, but have you ever really stopped to consider every single risk or adverse outcome before starting your work? Have you ever wondered how you might design a risk management plan from fundamental scientific principles? The International Organization for Standardization (ISO) is currently developing a whole new family of standards on risk management. We will demonstrate a suite of tools to help break down projects into individual action steps, and from these, identify the hazards and outcomes to be avoided. The tools then guide users through the process of creating a system to manage risks, avoid 'never events', and ensure organizational learning.

After iGEM

Sunday | Room 311 | 1:30 PM - 2:30 PM | Hosted by After iGEM

This workshop aims to share what After iGEM is all about and how you are already a part of it. Join our committees and carry out innitiatives. Gather around to hear the stories of our 2019's ambassadors, their experiences and how you could become one in 2020. Learn about the opportunities iGEMers have access to, such as the delegate and representative program. Finally, participate in a conversation on the future of after iGEM and your role in it.

iGEM Workshop**

Sunday | Room 312 | 1:30 PM - 2:30 PM | Hosted by Lynn Rothschild

For the last decade, NASA has looked to synthetic biology in pursuit of its mission, including aeronautics, earth science, astrobiology and notably, human exploration. Conversely, NASA advances the fundamental technology of synthetic biology as no one else can because of its leading expertise in the origin of life and life in extreme environments, including the potential for alternate life forms. This enables unique, creative "game changing" advances.

Since 2011 we have hosted an iGEM team of undergraduates from primarily Brown and Stanford, and this year, Princeton, to conduct synthetic biology research at NASA Ames Research Center. Examples of projects to date in our lab include biomaterial production, bioprinting, biomining and the creation of BioWires. The first synbio payload in space is PowerCell – a legacy of the 2011 Brown-Stanford and 2013 Stanford-Brown teams. Launched on a DLR (German Space Agency) satellite December 2018, it is the first step to making our vision of a synthetic biology-enabled human Mars colony a reality.

CCiC Meetup

Sunday | Room 204 | 7:00 PM - 8:00 PM | Hosted by CCiC

Conference of China iGEMer Community (CCiC) is a national-wide annual conference for Chinese iGEMers, which has a history of 6 years. We want to meet more Chinese iGEMers, to discuss what can we do to promote our community. Anyone interested in our community is welcome to join us.

Software Tools for Synthetic Biology Workflows

Sunday | Room 208 | 7:00 PM - 8:00 PM | Hosted by iGEM Measurement Committee

How do you illustrate the biological systems that you are building? This workshop will show how to create clear, unambiguous, and easy to understand diagrams using SBOL Visual 2.

Start-up Showcase

Sunday | Room 210 | 8:00 PM - 9:00 PM | Hosted by iGEM

Have you ever wondered what it takes to create your own iGEM start-up? Join us for a introduction to the iGEM Entrepreneurship Program and Panel discussion with iGEM founders at different stages of their start-up journey. They will discuss the challenges they have faced and overcome in creating their iGEM ventures and some of the resources available you to help you take your first steps to creating your iGEM projects beyond the competition!

HANDBOOK

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 the Hynes Command Center, available 24 hours a day, 7 days a week, at +1 - 617 - 954 - 2111. You can also contact iGEM Headquarters for assistance with other accessibility requests, or locate a volunteer in a light blue sweatshirt for assistance.

Email: hq@igem.org

Anti-harassment Policy

The iGEM Foundation strictly prohibits harassment of any kind. For the purposes of this policy, harassment may include but is not limited to the following:

- Any form of verbal, physical, and/or sexual harassment;
- Any conduct intended to threaten, intimidate, or coerce another individual;
- Uninvited physical contact;
- Unwelcome attention;
- Intimidation, stalking, or following; and
- Advocating for or encouraging any of the above behaviors.

Harassment can be verbal or nonverbal, and includes offensive comments, distribution, display, or discussion of offensive material. This also includes harassment online and/or over social media as well as in person.
iGEM Foundation staff 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. The iGEM Responsible Conduct Committee reviews all complaints and determines what, if any, action will be taken.

To report an incident:

In person: please visit the iGEM Headquarters Table outside of Hall C on the second floor or the Information Desk on the third floor. See the maps for the location.

By email: hq@igem.org or rcc@igem.org

By text message or phone call: +1 - 401 - 787 - 0216 (direct line to Traci Haddock-Angelli, Director of the Competition, iGEM Foundation)

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 C.

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 Registration Representative registration packet. Award Representatives must wear their wristbands to the Monday 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 Monday. 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 Monday November 4. 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 Registration Representative packet. Awards and medals are awarded at the judges' discretion at the Giant Jamboree.

Medals, award certificates, and trophy boxes (to safely transport crystal trophies) will be distributed from the registration area of the second floor, Boylston Hallway, after the Awards Ceremony. 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 in the Registration Representative's packet. 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 the iGEM Instructor's Social. 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:

Hynes Convention Center Location

900 Boylston Street
Boston, MA 02215
+1 - 617 - 954 - 2725
Open Hours:
Monday - Friday: 9 AM - 5 PM
Saturday- Sunday: Closed

Sheraton Hotel Location

39 Dalton Street
Boston, MA 02199
+ 1 - 617 - 587 - 5444
Open Hours:
Monday - Friday: 7 AM - 7 PM
Saturday: 8 AM - 5 PM
Sunday: 9 AM - 4 PM

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 on Saturday and Sunday by Care.com and is available by advanced registration only.
Childcare providers are 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 to during the event day. Toys and a full agenda of age-appropriate activities will be provided.

Closing Ceremony and Award Ceremony

Monday | Auditorium | 9:00 AM - 3:00 PM

The Monday 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 refreshments in Halls C and D. Teams should remove their posters from the Halls by the end of the break.

The afternoon program includes 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 registration area of the second floor, 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:

Director of the Competition

Traci Haddock-Angelli
+1 - 401 - 787 - 0216

Assistant Director of Operations

Kitwa Ng
+1 - 646 - 250 - 1012

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. Cords and/or wires are not allowed in walkways, such as aisles, doorways, tables/chairs, etc

Emergency Information - Hynes Convention Center

If there is an emergency (medical emergency, police, etc.) inside the Hynes Convention Center, 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

You may also contact Emergency Service providers by dialing 911 from a cell phone, but this action could significantly delay the response network within the Hynes. If you call 911 first, please follow up by calling the Hynes Convention Command Center +1 - 617 - 954 - 2111 to inform them that you have already called 911.

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 C.

Emergency Information - Boston

If you are outside of the Hynes Convention Center, dial 911 for police, medical, or fire emergencies. When you may safely do so, please notify iGEM HQ of the emergency by visiting the iGEM Headquarters Table outside of Hall C, or emailing us at hq AT igem DOT org.

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 located in Hall D 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, HQ Table outside of Hall C, 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: #iGEM2019 #GiantJamboree

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

Gender-Neutral Bathrooms

Attendees of any gender or gender identity are welcome to use the gender-neutral bathrooms. Two fully-accessible single occupancy bathrooms are available on the third floor of the Hynes Convention Center behind the main elevators. See the maps for the location.

General Release Form

The iGEM 2019 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 at Customer Service. If you have any questions or need further clarification, feel free to ask an iGEM staff member or volunteer in a light blue sweatshirt.

Hubs

Hall C and Hall D 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 Lounge

Need a break to relax and recharge from the Giant Jamboree activities? Join us at the IDT lounge! 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 Friday, Saturday, and Sunday to check it out! The IDT Suite is in room 207 across from Hall C.

iGEM Headquarters (HQ) Table & Information Desk

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

iGEMers' Prize

Vote for your favorite high school and collegiate iGEM teams! This year we are continuing the tradition of the iGEMers' Prize. One ballot will be provided to the Registration Representative of each team at registration. Completed ballots can be dropped off at the iGEM HQ Table outside of Hall C. Be on the lookout for your prize ballot and be sure to vote by Sunday 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

Lactation Room for Nursing Mothers

We are offering a private lactation room for nursing mothers in Room 301 at the following times:

- Thursday 4:00 PM - 8:00 PM
- Friday 7:30 AM - 8:00 PM
- Saturday 8:30 AM - 8:00 PM
- Sunday 8:30 AM - 8:00 PM
- Monday 8:30 AM - 3:00 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.

The Hynes Convention Center also has a Mamava nursing pod on the first floor, near the entrance to the Prudential Center. Mamava is a lockable nursing pod with seating and electrical outlets. It can be accessed from the Mamava app.

Meals - Dietary Restrictions

If you indicated a dietary restriction of either Kosher/Halal, or life-threatening allergy your registration, please do not take lunch from the general buffet selections. Your lunch will be available at the dietary restriction table in Hall D. A lunch ticket indicating your restriction is included with your badge and should be shown to wait staff to receive your lunch. Vegan, vegetarian, and gluten-free options will be available at all buffet stations.

Meals and Snacks

A light lunch is provided on Friday, Saturday, and Sunday in Halls C and D. Light refreshments including snacks and beverages are provided in the Hubs during the poster sessions on Friday, Saturday, and Sunday, and during the break on Monday.

Participation Certificates

Every approved team member listed on the official team roster will receive a participation certificate. These certificates will be provided to the Registration Representative in the registration packet they receive at check in. It is the Registration Representative'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 among 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 Friday morning by 11:00 AM.

Each team is assigned to the TWO poster sessions that are scheduled on the day of their presentation. Each team is expected to present their poster at both of their assigned sessions. This means that if you present on Friday, then you are expected to be at your poster during both the afternoon (1:00-2:30pm) and evening poster sessions (6:30-8:00pm) on Friday.

All teams must remove their posters by Monday afternoon at 1:00 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.

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 ten 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 Friday, Saturday, and Sunday. 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.

- Thursday 3:00 PM - 8:00 PM
- Friday 7:00 AM - 8:00 PM
- Saturday 8:30 AM - 6:00 PM
- Sunday 8:30 AM - 6:00 PM
- Monday 8:00 AM - 1:00 PM

Registration check-in is on a team basis and each team's materials will be filed by the official team name. Each team should designate one team member as the Registration Representative. This individual will be responsible for picking up the Registration Representative Packet which includes the team's attendee badges, participation certificates, the ballot for the iGEMer's prize, and two bracelets for the team members who will serve as Award Representatives during the Monday events. Each team is responsible for selecting their own Registration Representative, who will be required to sign in when picking up the Registration Representative Packet. Note that the Registration Representative does not need to be your team's student leader or team PI. Choose a Representative who accepts the responsibility of picking up the materials and distributing them to the rest of your team.

Materials of team members who have not completed their registration payment will not be included in the Registration Representative Packet. Unpaid team member(s) must make payment and pick up their registration materials at the Customer Service booth on the second floor, Boylston Hallway.

Registration Representative

Each team should designate one team member as the Registration Representative. This individual will be responsible for picking up the Registration Representative Packet which includes the team's attendee badges, participation certificates, the ballot for the iGEMer's prize, and two bracelets for the team members who will serve as Award Representatives during the Monday events. Each team is responsible for selecting their own Registration Representative, who is required to sign in when picking up the Registration Representative Packet. Note that the Registration Representative does not need to be your team's student leader or team PI. Choose a Representative who accepts the responsibility of picking up the materials and distributing them to the rest of your team.

T-Shirts

Remember to collect your free iGEM T-Shirt beginning at 9:30 AM on Friday on the second floor, Boylston Hallway! T-shirts can be picked up any time during Jamboree registration hours, while supplies last. A T-shirt ticket (included in your registration material) is required.

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.

Transportation

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.mbta.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

Reusable iGEM water bottles will be available at the registration area on the second floor in Boylston Hallway beginning on Friday morning at 9:30 AM. 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

Team Name	Poster Zone	Number	Day
Aachen	Zone 3	260	Saturday
Aalto-Helsinki	Zone 2	133	Saturday
ACIBADEM ISTANBUL	HS Zone 2	HS 52	Friday
AFCM-Egypt	Zone 1	64	Saturday
AHUT China	Zone 3	261	Friday
Aix-Marseille	Zone 3	226	Saturday
Alabama	Zone 2	159	Friday
Alma	Zone 2	114	Friday
Amazonas-Brazil	Zone 3	235	Saturday
ASIJ Tokyo	HS Zone 2	HS 7	Saturday
ASTWS-China	HS Zone 2	HS 51	Saturday
Athens	Zone 1	70	Saturday
Auburn Alabama	HS Zone 1	HS 44	Saturday
Austin UTexas	Zone 2	134	Friday
Baltimore BioCrew	HS Zone 2	HS 56	Sunday
BEAS China	HS Zone 1	HS 23	Saturday
BGU Israel	Zone 2	212	Sunday
BHSF ND	HS Zone 1	HS 38	Saturday
Bielefeld-CeBiTec	Zone 3	245	Saturday
Bilkent-UNAMBG	Zone 3	224	Friday
Bio Without Borders	HS Zone 1	HS 36	Sunday
Bioriidl Somaiya	Zone 1	19	Friday
BIT	Zone 1	111	Saturday
BIT-China	Zone 3	262	Friday
BM-AMU	Zone 1	15	Friday
BNDS China	HS Zone 1	HS 33	Saturday
BNU-China	Zone 1	13	Sunday
BOKU-Vienna	Zone 1	65	Friday
Bonn	Zone 2	143	Saturday

Botchan Lab Tokyo	Zone 3	237	Saturday
British Columbia	Zone 1	53	Sunday
BrockU	Zone 1	66	Saturday
BrownStanfordPrinctn	Zone 1	9	Saturday
BSC United	HS Zone 2	HS 69	Saturday
BUAP Mexico	Zone 1	80	Sunday
BUCT-China	Zone 2	169	Friday
Bulgaria	Zone 3	248	Saturday
Calgary	Zone 2	166	Friday
Canterbury Chch NZ	Zone 3	264	Saturday
CAU China	Zone 1	58	Saturday
CCA San Diego	HS Zone 2	HS 9	Friday
CCU Taiwan	Zone 2	210	Saturday
Chalmers-Gothenburg	Zone 3	228	Friday
CMUQ	Zone 1	78	Sunday
Concordia-Montreal	Zone 1	24	Friday
Cornell	Zone 1	42	Friday
Costa Rica	Zone 1	84	Friday
CPU CHINA	Zone 1	52	Saturday
CSL Pittsburgh	HS Zone 2	HS 66	Friday
CSMU Taiwan	Zone 3	239	Saturday
CSU CHINA	Zone 2	116	Sunday
CSU Fort Collins	Zone 2	206	Friday
CU	Zone 2	174	Friday
CU-Boulder	Zone 2	144	Saturday
DNHS SanDiego	HS Zone 2	HS 70	Sunday
DTU-Denmark	Zone 1	61	Sunday
Duesseldorf	Zone 2	191	Friday
DUT China A	Zone 1	7	Sunday
DUT China B	Zone 1	68	Friday
East Chapel Hill HS	HS Zone 1	HS 37	Sunday
ECUST China	Zone 2	183	Saturday

Edinburgh OG	Zone 2	140	Friday
Edinburgh UG	Zone 1	29	Friday
EPFL	Zone 1	44	Sunday
ETH Zurich	Zone 2	151	Saturday
Evry Paris-Saclay	Zone 2	209	Friday
Exeter	Zone 1	95	Saturday
FAFU-CHINA	Zone 2	192	Friday
FAU Erlangen	Zone 2	141	Saturday
FDR-HB Peru	HS Zone 2	HS 46	Sunday
Florida	Zone 3	266	Sunday
Freiburg	Zone 2	187	Sunday
FSU	Zone 2	152	Saturday
Fudan	Zone 1	109	Sunday
Fudan-TSI	Zone 1	20	Saturday
Gaston Day School	Zone 2	122	Sunday
GDSYZX	HS Zone 2	HS 50	Friday
GENAS China	HS Zone 1	HS 19	Sunday
Georgia State	Zone 1	5	Sunday
GIFU TOKAI	Zone 2	214	Friday
GO Paris-Saclay	Zone 2	127	Sunday
Greatbay SCIE	HS Zone 1	HS 28	Sunday
GreatBay SZ	HS Zone 1	HS 39	Friday
Grenoble-Alpes	Zone 2	164	Saturday
Groningen	Zone 1	108	Saturday
Guelph	Zone 2	139	Friday
Gunma	Zone 3	241	Friday
GZHS-United	HS Zone 2	HS 61	Saturday
Hamburg	Zone 1	4	Sunday
Hangzhou WestLake	HS Zone 1	HS 2	Saturday
Harvard	Zone 1	36	Saturday
HBUT-China	Zone 1	96	Friday
HK GTC	HS Zone 1	HS 12	Saturday

HK SKHLPSS	HS Zone 2	HS 65	Sunday
HK SSC	HS Zone 1	HS 3	Saturday
Hong Kong HKU	Zone 1	41	Saturday
Hong Kong HKUST	Zone 3	232	Saturday
Hong Kong JSS	HS Zone 2	HS 6	Friday
Hong Kong LFC PC	HS Zone 2	HS 60	Sunday
Hong Kong UCCKE	HS Zone 1	HS 20	Saturday
Hong Kong-CUHK	Zone 1	12	Sunday
HUBU-WUHAN	Zone 1	56	Sunday
Humboldt Berlin	Zone 2	199	Sunday
HUST-China	Zone 2	208	Saturday
HZAU-China	Zone 1	43	Sunday
HZNFHS Hangzhou	HS Zone 1	HS 34	Friday
iBowu-China	HS Zone 2	HS 54	Saturday
IISc-Bangalore	Zone 3	243	Friday
IISER Bhopal	Zone 1	25	Sunday
IISER Kolkata	Zone 2	124	Friday
IISER Tirupati	Zone 1	38	Saturday
IISER-Pune-India	Zone 1	79	Saturday
IIT Chicago	Zone 1	21	Saturday
IIT-Madras	Zone 1	75	Friday
Ionis Paris	Zone 1	59	Friday
ITB Indonesia	Zone 3	227	Friday
ITESO Guadalajara	Zone 2	147	Saturday
Jiangnan-China	Zone 2	203	Friday
JiangnanU China	Zone 2	142	Saturday
Jiangsu High School	HS Zone 1	HS 14	Friday
Jilin China	Zone 2	177	Friday
JNFLS	HS Zone 1	HS 22	Sunday
JNU-China	Zone 3	246	Sunday
KAIT JAPAN	Zone 2	113	Friday
KCL UK	Zone 1	11	Friday

KOREA	HS Zone 1	HS 17	Sunday
Korea HS	HS Zone 2	HS 55	Saturday
KU LEUVEN	Zone 2	117	Sunday
KUAS Korea	Zone 3	258	Friday
Kyoto	Zone 1	87	Saturday
LACAS BioBots	HS Zone 1	HS 10	Friday
Lambert GA	HS Zone 2	HS 62	Sunday
Leiden	Zone 2	216	Friday
Lethbridge	Zone 2	123	Sunday
Lethbridge HS	HS Zone 1	HS 30	Saturday
Linkoping Sweden	Zone 2	125	Saturday
Lubbock TTU	Zone 1	37	Friday
Lund	Zone 1	8	Saturday
LZU-CHINA	Zone 3	234	Sunday
Macquarie Australia	Zone 2	207	Sunday
MADRID UCM	Zone 2	138	Saturday
MADRID UCM HS	HS Zone 1	HS 32	Friday
Manchester	Zone 3	263	Saturday
Marburg	Zone 3	252	Friday
Michigan	Zone 3	223	Sunday
MichiganState	Zone 3	265	Saturday
Mines	Zone 3	251	Saturday
Mingdao	HS Zone 2	HS 59	Friday
Missouri Miners	Zone 2	178	Saturday
MIT	Zone 2	180	Friday
MITADTBIO Pune	Zone 3	233	Friday
Montpellier	Zone 2	175	Sunday
Moscow	Zone 1	47	Sunday
MSP-Maastricht	Zone 2	131	Sunday
Munich	Zone 2	155	Saturday
Nanjing	HS Zone 1	HS 1	Saturday
Nanjing High School	HS Zone 2	HS 58	Saturday

Nanjing NFLS	HS Zone 1	HS 35	Sunday
Nanjing-China	Zone 3	221	Saturday
Nantes	Zone 2	145	Sunday
NAU-CHINA	Zone 1	97	Friday
Navarra BG	HS Zone 1	HS 4	Friday
NAWI Graz	Zone 1	63	Friday
NCHU Taichung	Zone 2	194	Sunday
NCKU Tainan	Zone 3	236	Friday
NCTU Formosa	Zone 2	197	Saturday
NEFU China	Zone 2	154	Sunday
NEU CHINA	Zone 1	72	Friday
Newcastle	Zone 2	185	Sunday
NJTech China	Zone 2	201	Saturday
Northern BC	Zone 2	200	Sunday
Northwestern	Zone 1	45	Saturday
Nottingham	Zone 3	242	Friday
NTHU Taiwan	Zone 1	102	Friday
NTU-Singapore	Zone 2	118	Friday
NU Kazakhstan	Zone 2	121	Saturday
NUDT CHINA	Zone 2	165	Sunday
NUS Singapore	Zone 1	57	Sunday
NWU-China	Zone 1	28	Friday
NYMU-Taipei	Zone 2	156	Sunday
NYU Abu Dhabi	Zone 1	46	Sunday
NYU New York	Zone 2	179	Saturday
NYU Shanghai	Zone 2	162	Friday
OhioState	Zone 2	205	Sunday
Orleans	Zone 1	34	Friday
OUC-China	Zone 3	257	Saturday
Oxford	Zone 2	158	Friday
Pasteur Paris	Zone 1	76	Saturday
Peking	Zone 2	198	Sunday

Penn	Zone 1	107	Friday
Pittsburgh	Zone 3	229	Sunday
Poitiers	Zone 1	74	Sunday
Potsdam	Zone 1	6	Saturday
PuiChing Macau	HS Zone 1	HS 43	Friday
Purdue	Zone 1	77	Saturday
QDHS Shanghai	HS Zone 2	HS 48	Friday
QHFZ-China	HS Zone 1	HS 29	Sunday
Queens Canada	Zone 2	181	Saturday
RDFZ-China	HS Zone 2	HS 67	Sunday
REC-CHENNAI	Zone 2	112	Sunday
RHIT	Zone 2	126	Friday
Rice	Zone 3	268	Friday
Richmond UR	Zone 2	132	Sunday
RIS BKK	HS Zone 1	HS 31	Sunday
Rotterdam HR	Zone 1	89	Saturday
Ruperto Carola	Zone 2	160	Saturday
Saint Joseph	HS Zone 1	HS 41	Friday
Sao Carlos-Brazil	Zone 1	100	Saturday
SASTRA Thanjavur	Zone 1	40	Friday
SBS NY	HS Zone 2	HS 45	Sunday
SCU-China	Zone 2	173	Saturday
SCUT China	Zone 1	50	Sunday
SDSZ China	HS Zone 1	HS 15	Saturday
SDU CHINA	Zone 3	222	Friday
SDU-Denmark	Zone 3	250	Friday
SEFLS Shanghai	HS Zone 1	HS 25	Friday
SEU	Zone 1	48	Saturday
SEU-Nanjing-China	Zone 1	105	Sunday
Shanghai City	HS Zone 1	HS 40	Friday
Shanghai High School	HS Zone 1	HS 26	Friday
Shanghai HS	HS Zone 1	HS 27	Friday

Shanghai HS United	HS Zone 2	HS 53	Sunday
Shanghai YGQ	HS Zone 1	HS 16	Friday
Shanghai-United	HS Zone 2	HS 57	Sunday
ShanghaiFLS China	HS Zone 2	HS 71	Saturday
ShanghaiTech China	Zone 1	69	Saturday
Sheffield	Zone 1	22	Saturday
Shenzhen SFLS	HS Zone 2	HS 63	Saturday
SHSBNU China	HS Zone 2	HS 64	Sunday
SHSSIP-CHINA	HS Zone 2	HS 73	Friday
SIS Korea	HS Zone 1	HS 24	Saturday
SJTU-BioX-Shanghai	Zone 1	10	Saturday
SJTU-software	Zone 2	211	Sunday
SMMU-China	Zone 2	168	Sunday
SNU India	Zone 3	231	Saturday
Sorbonne U Paris	Zone 2	193	Friday
SoundBio	HS Zone 2	HS 47	Friday
Sriwijaya	Zone 1	110	Friday
St Andrews	Zone 1	26	Friday
Stanford	Zone 2	217	Saturday
Stockholm	Zone 1	33	Sunday
Stony Brook	Zone 1	91	Saturday
Strasbourg	Zone 3	269	Saturday
Stuttgart	Zone 1	31	Saturday
SUIS Shanghai	HS Zone 1	HS 21	Sunday
SUSTech Shenzhen	Zone 2	202	Saturday
Sydney Australia	Zone 2	115	Friday
SYSU-CHINA	Zone 1	51	Friday
SYSU-Medicine	Zone 2	182	Saturday
SZPT-CHINA	Zone 2	188	Sunday
SZTA Szeged HU	HS Zone 2	HS 74	Saturday
SZU-China	Zone 1	92	Saturday
Tacoma RAINmakers	Zone 2	213	Saturday

Tartu TUIT	Zone 2	170	Sunday
TAS Taipei	HS Zone 2	HS 5	Friday
TAU Israel	Zone 1	1	Saturday
Tec-Chihuahua	Zone 1	17	Sunday
Tec-Monterrey	Zone 2	220	Friday
Technion-Israel	Zone 3	255	Friday
TecMonterrey GDL	Zone 1	98	Sunday
TelHai-Migal Israel	Zone 3	254	Friday
Thessaloniki	Zone 2	171	Saturday
Thessaly	Zone 2	189	Friday
Tianjin	Zone 1	30	Friday
TJUSLS China	Zone 1	18	Sunday
TokyoTech	Zone 1	73	Friday
Tongji China	Zone 3	238	Sunday
Tongji Software	Zone 1	32	Saturday
Toronto	Zone 2	137	Friday
TPHS San Diego	HS Zone 2	HS 8	Saturday
Tsinghua	Zone 2	146	Saturday
Tsinghua-A	Zone 1	71	Friday
TU Darmstadt	Zone 2	196	Saturday
TU Dresden	Zone 1	49	Saturday
TU Eindhoven	Zone 1	60	Saturday
TU Kaiserslautern	Zone 1	23	Sunday
TUDelft	Zone 2	150	Sunday
Tuebingen	Zone 3	249	Saturday
Tufts	Zone 1	27	Friday
Tunghai TAPG	Zone 1	16	Sunday
UA Huntsville	Zone 2	219	Saturday
UAAAN	Zone 1	104	Friday
UAlberta	Zone 1	101	Friday
UANL	Zone 3	225	Friday
UC Davis	Zone 2	195	Saturday

UC San Diego	Zone 1	3	Friday
UCAS-China	Zone 3	247	Friday
UChicago	Zone 3	270	Saturday
UCL	Zone 2	163	Sunday
UCopenhagen	Zone 1	55	Sunday
UCSC	Zone 3	271	Saturday
UESTC-China	Zone 3	240	Saturday
UESTC-Software	Zone 2	172	Saturday
UFRGS Brazil	Zone 1	90	Sunday
UGA	Zone 2	149	Sunday
UI Indonesia	Zone 2	129	Saturday
UiOslo Norway	Zone 1	103	Sunday
UIUC Illinois	Zone 3	256	Friday
ULaval	Zone 2	190	Saturday
ULaVerne Collab	Zone 2	120	Sunday
UM Macau	Zone 2	204	Saturday
UNebraska-Lincoln	Zone 2	157	Saturday
UniGE-Geneva	Zone 3	230	Saturday
Unimelb	Zone 1	86	Saturday
UNSW Australia	Zone 1	39	Friday
uOttawa	Zone 1	94	Friday
UPNAvarra Spain	Zone 1	62	Saturday
Uppsala Universitet	Zone 1	35	Sunday
UPRM	Zone 2	136	Friday
US AFRL CarrollHS	HS Zone 1	HS 13	Friday
USAFA	Zone 2	215	Friday
USP SaoCarlos-Brazil	Zone 3	253	Sunday
USP-Brazil	Zone 1	88	Sunday
USTC	Zone 2	135	Friday
USTC-Software	Zone 1	81	Friday
UTArlingtonTexasUSA	Zone 1	106	Friday
UZurich	Zone 1	2	Friday

Victoria Wellington	Zone 1	83	Sunday
Vilnius-Lithuania	Zone 2	167	Friday
Virginia	Zone 2	184	Friday
VIT Vellore	Zone 2	119	Friday
Wageningen UR	Zone 2	153	Sunday
Warwick	Zone 1	99	Sunday
Washington	Zone 1	85	Saturday
Waterloo	Zone 2	218	Saturday
Western Canada	Zone 2	176	Friday
Westminster UK	Zone 2	128	Sunday
WHU-China	Zone 1	54	Friday
William and Mary	Zone 2	161	Sunday
WLC-Milwaukee	Zone 3	267	Sunday
Worldshaper-Shanghai	HS Zone 2	HS 49	Sunday
Worldshaper-Wuhan	HS Zone 2	HS 72	Sunday
Worldshaper-XSHS	HS Zone 1	HS 11	Sunday
Wroclaw	Zone 2	148	Sunday
XHD-WS-Wuhan-A	HS Zone 2	HS 68	Friday
XHD-WS-Wuhan-B	HS Zone 1	HS 18	Friday
Xiamen City	HS Zone 1	HS 42	Saturday
XJTLU-CHINA	Zone 1	93	Sunday
XJTU-CHINA	Zone 2	186	Sunday
XMU-China	Zone 3	259	Sunday
YAU-China	Zone 1	14	Sunday
ZJU-China	Zone 2	130	Sunday
ZJUT-China	Zone 3	244	Sunday

ABSTRACTS

Aachen

Location:	Germany	**Track:**	Environment
Region:	Europe	**Presentation:**	Saturday - Room Ballroom A - 11:30 AM
Section:	Overgrad	**Poster:**	Zone 3 - 260

Plastractor - extracting microplastics from fluids via magnets

Nowadays the problem of microplastics in fluids like drinkable water is a huge topic with a lot of new publications and studies about the amount, types and risks of it for animals, environment and humans. The 'Plastractor' is a device which shall extract microplastics from fluids easily via magnets. Therefore the bacterium Rhodospirillum rubrum 'magneticum' was obtained. It is genetically modified to build magnetosomes; small magnetic and vesicle-like particles, with plastic binding peptides on its membrane. For modification we use E. coli BW29427 which transfers the needed plasmid to Rhodospirillum rubrum 'magneticum' via conjugation. Two different plastic binding peptides are used, 'Tachystatin A2' (TA2) and 'liquid chromatography peak I' (LCI), fused with two different fluorescent proteins to enable the detection of the bound particles. Thus the device will be able to extract the plastics that are bound to magnetosomes and detect it by fluorescence.

Aalto-Helsinki

Location:	Finland	**Track:**	Manufacturing
Region:	Europe	**Presentation:**	Saturday - Room 311 - 4:30 PM
Section:	Overgrad	**Poster:**	Zone 2 - 133

VibXPRESSO - A Vibrio natriegens strain for efficient production and secretion of recombinant proteins

Recombinant proteins are widely used in biomedical research and as biopharmaceutical compounds. Even with today's technologies, improved efficacy is necessary as the demand for recombinant proteins is increasing □ it has been estimated that within the next ten years half of all medicines developed will be biopharmaceuticals.Our iGEM project introduces VibXPRESSO - Vibrio natriegens with Xtreme PRotein Expression and Secretion Optimization. We harness the gram-negative bacterium's generation time of under 10 minutes to rapidly produce large amounts of protein for efficient purification. This is achieved via the twin-arginine translocation (Tat) pathway, that secretes proteins into the bacterium's periplasm. By environmental modifications we have increased the outer membrane leakiness ofV. natriegens, to direct proteins from the periplasm into the growth medium for easier protein harvest. As a proof of concept, we compared the yield of human growth hormone between V. natriegens WT ATCC 14048 and our modified VibXPRESSO strain.

Aboa

Location:	Finland	**Track:**	Diagnostics
Region:	Europe	**Presentation:**	Friday - Room 210 - 11:30 AM
Section:	Overgrad	**Poster:**	Zone 1 - 67

Expanded genetic code to control antibody orientation in immunodiagnostics

Antibody based diagnostic tests or immunoassays are widely used to quicken treatment decision-making and to enable patients to test themselves for example for pregnancy. However, the analyte binding antibodies in conventional immunoassays are randomly immobilized onto a test surface blocking some binding sites from the analytes. When the concentration of a disease marker as the analyte is below the detection limit or the sensitivity, the signal could be improved by orienting the antibodies. Our objective was to orientate a digoxigenin binding Fab fragment of the antibody by incorporating a p-azido-L-phenylalanine, an unnatural amino acid with click chemistry properties. As a control, we used a chemically treated Fab including azide in random locations. The Fabs were immobilized onto DBCO coated magnetic beads and the bound fluorescently labeled digoxigenin was measured with flow cytometry. According to the results, orientation improved the signal and made the test surface more homogeneous.

ACIBADEM ISTANBUL

Location:	Turkey	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 311 - 10:00 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 52

Designing a wide spectrum synthetic antivenom: VenomXL

The Opossum 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 synthetic and cost effective version of the active domain of the protein as a synthetic anti-venom for human use. VenomXL incorporates the power of the post-translational modification processes primarily methylation or acetylation on critical locaion of the active polypeptide of the LTNF. The polypeptide is circularized, 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

Location:	Egypt	**Track**:	Therapeutics
Region:	Africa	**Presentation**:	Saturday - Room 310 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 64

A Modular TanCAR T-Cell Framework Targeting Schistosomiasis-Associated Bladder Cancer: An In Vitro Study

Bladder Cancer is the 7th most common cancer among males and 17th among females. Egypt ranks 10th amongst the countries with highest bladder cancer incidence rates. This has been attributed to endemic parasitic infestation with Schistosoma Hematobium.Schistosomiasis-associated bladder cancer constitutes 60% of cases. In our project, we aimed toengineer the chimeric antigen receptor T-cells capableoftargeting schistosomiasis-associated bladder cancer cells as well as overcoming the immuno-suppressive conditions associated with the tumor microenvironment. To achieve this purpose, we devised a computational framework for antibody design producing single chain variable fragments which target intracellular antigens. We then engineered dual 4th generation TanCAR-T cells (using CRISPR-CAS9) with enhanced cytokine production and a dual functionality against cancer cells as well as the egg form of the parasite. We also optimized the CAR design by directed silencing of exhaustiveness-inducing transcription factors utilizing a computational pipeline for designing and optimizing silencing RNAs cassettes.

AHUT China

Location:	China	**Track**:	Environment
Region:	Asia	**Presentation**:	Friday - Room 311 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 261

Carbon Dioxide Capturer 2.0

In this project, we intended to immobilized the mutated carbonic anhydrase (CA□) estabilied last year on carriers with amino groups to further improve its application in CO2 capture. Specifically, site-specific immobilization method was realized via protein labeling. Firstly, sulphatase motif (LCTASR) was added to the terminus of mutated carbonic anhydrase (CA□-LCTASR) by genetic engeneering method; then, an aldehyde tag was introduced to the mutated carbonic anhydrase by co-transforming the recombinant plasmid CA□-LCTASR and formyglycine-modified enzyme expression system myc-his A Rv0712 (FGE) into E.coli TB1; finally, the aldehyde-tagged CA□ were immobilized via forming covalent with amino functionalized supports through the Schiff base reaction. Our results revealed that CA□ could be successfully immobilized and retained its original activity.

Aix-Marseille

Location:	France	**Track:**	Diagnostics
Region:	Europe	**Presentation:**	Saturday - Room 302 - 11:00 AM
Section:	Overgrad	**Poster:**	Zone 3 - 226

I WANT TB FREE

Tuberculosis is a major public health problem in many regions of the world, both developing countries and in 'risky' populations in richer countries. The Aix Marseille University iGEM team has developed their project 'I Want TB Free'. The aim of this project is to develop a diagnostic test for tuberculosis that is cheap, rapid, specific and sensitive, has a long shelf-life and easily deployable in regions of the world with little or no scientific infrastructure. The test will specifically detect low levels of Mycobacterium tuberculosis in readily accessible sputum samples generating a colored band on a test strip, enabling earlier diagnosis and more effective treatment than currently available tests.The 'I want TB Free' project is developed by a multidisciplinary team of students from different faculties and departments of Aix-Marseille University over the summer of 2019. The design builds on published work and integrates several innovations to achieve its aims.

Alabama

Location:	United States	**Track:**	Therapeutics
Region:	North America	**Presentation:**	Friday - Room 313 - 2:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 159

Gemcitabine / CDD Knock-Out (GemCKO) to Mitigate Chemotherapeutic Drug Resistance Caused by Intratumoral Bacteria

Gemcitabine is a chemotherapy drug used to treat pancreatic, breast, bladder, ovarian, and non-small cell lung cancer. Alabama iGEM explored a previously reported link between the intratumoral bacterial environment of pancreatic adenocarcinoma to confirm and characterize the direct consumption of gemcitabine by comparable bacteria such as some strains of E. coli. It has been shown that the production of a specific type of the cytidine deaminase (CDD) protein by these bacteria render the gemcitabine unusable to treat the target cancer. We constructed a plasmid and used it to knock out the cdd gene from E. coli BL21(DE3), and compared growth of knockout and wild-type strains. Degradation of gemcitabine by the wild-type strain was determined by HPLC. We further developed a suite of modular E. coli expression plasmids, with each plasmid component flanked by a unique restriction site, that will facilitate cloning in the future.

Alma

Location:	United States	**Track**:	Therapeutics
Region:	North America	**Presentation**:	Friday - Room 310 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 114

Plaque Attack

Cardiovascular disease is a class of disease consisting of illnesses that affect the heart and blood vessels. This class of disease is the leading cause of death in the United States, responsible for one in every four deaths. Atherosclerosis is a type of cardiovascular disease that begins as macrophages and cholesterol infiltrate arterial walls forming atherosclerotic plaques. Formation of these plaques is instigated by Trimethylamine n-oxide (TMAO), with originates as the Carnitine metabolism byproduct Trimethylamine (TMA). Production of TMA is carried out by gut bacteria in the small intestine. We have sought to develop a counteracting bacteria that would degrade TMA before it is absorbed into the bloodstream. This probiotic strain contains genes from a Methanogenic bacteria that can convert the TMA into less harmful by-products.

Amazonas-Brazil

Location:	Brazil	**Track**:	Therapeutics
Region:	Latin America	**Presentation**:	Saturday - Room 306 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 3 - 235

BeliE.V.E. - an Engineered Vehicle to End-cancer

One of the current applications of synthetic biology is to turn organisms into living therapeutics. In this context, reprogrammed cells emerge as powerful vehicles for drug delivery.We are engineering a robust, interchangeable and modular framework composed by an AND logic gate suitable for multiple tumor microenvironment inputs (e.g., hypoxia AND high levels of lactate), as predicted by our model. As proof of concept, we genetically engineered E. coli Nissle 1917 to quantify the AND logic gate dynamic range. We envision EVE driving the production of antitumoral payloads of interest. Also, we built a low-cost and open-source reproducible CO2 incubator to help both our and other teams in cell culture. In Human Practices, EVE represents our desire to understand people, seeing them beyond their diseases. Our project aims to offer a framework to overcome the current challenges of conventional cancer therapy. Recognize. Reprogram. BeliE.V.E.

ASIJ Tokyo

Location:	Japan	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 210 - 10:00 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 7

sWHEAT Solution

With an estimated 500 million patients worldwide, Diabetes mellitus (DM) presents a major threat to human health. Largely attributed to genetics and lifestyle choices, Type II DM reduces insulin responses to elevations in blood glucose. Though current treatments for pre-diagnosed DM patients largely include drug prescriptions and restrictive diets, we believe a supplement to ease dietary constraints would be beneficial particularly within the Japanese community. For our project, we designed a construct that will express a wheat albumin (0.19), which acts as an α-amylase inhibitor, thus hindering α-amylase's ability to break starches into glucose. Specific amino acid substitutions were made in 0.19 to improve inhibitory activity. Our proposed delivery mechanism is through miso, a staple Japanese bean paste. With this supplement, patients will not be completely restricted from the traditionally high-carb Japanese diet presenting a potential strategy for reducing carbohydrate-based dietary restrictions experienced by many pre-diagnosed type II DM patients.

ASTWS-China

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 306 - 4:30 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 51

Antibiotics detection and degradation system

Antibiotics serve an important role in controlling infectious diseases. However, incorrect use of antimicrobial agents may cause environment contamination. During this season, our team has designed a novel system to detect and degrade β-lactams in order to provide a potential solution to antibiotic pollution. Mec system from Staphylococcus aureus and the β-lactamase blaCMY-10 in Enterobacter aerogenes were designed as our antibiotics detective and degradative system respectively, which were adapted into E. coli. The results of antibiotics detection illustrated that it can be sensitive to low concentration of ampcilin. And the zone of inhibition test showed that blaCMY10 can effectively degrade ampcilin, cephalothin and cefoxitin which is consistent with what we expected. In our final applied design, we aim to create a combined device, it can be installed at wastewater treatment facilities and the drainage outlet at hospitals, farms and so on.

Athens

Location:	Greece	**Track**:	New Application
Region:	Europe	**Presentation**:	Saturday - Room 210 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 1 - 70

MEDEA: Machine-Enhanced Directed Evolution of Aptamers

Nowadays, aptamers binding to specific targets are synthesized via SELEX. While effective, SELEX requires specialized equipment, trillions of initial oligonucleotides, and considerable time and cost. Therefore, our teamproposes a novel mechanism of aptamer development, MEDEA - Machine Enhanced Directed Evolution of Aptamers. Our project aims to create a platform for the evolution of optimised aptamers, in E. coli cells. The evolution of our aptamer sequence is achieved through the interaction of three modules: the aptamer module, the mutagenesis module and the selection module. The aptamer module contains the aptamer sequence connected to a ribozyme. When the aptamer binds to its target, the ribozyme is activated, cleaving a Small Transcription Activating RNA. The STAR enables the transcription of an antibiotic resistance gene, used for selection. Mutagenesis is performed by the EvolvR system. The first step in our revolutionary pipeline is a software to create highly specific initial aptamers.

Auburn Alabama

Location:	United States	**Track**:	High School
Region:	North America	**Presentation**:	Saturday - Room 309 - 12:00 PM
Section:	High School	**Poster**:	HS Zone 1 - HS 44

Characterization of the rcn promoter for nickel sensitivity

The presence of nickel in cheap jewelry can often lead to allergic contact dermatitis, involving redness, dry patches of skin, and even blisters. Furthermore, nickel is prevalent in everyday items, such as eyeglass frames, coins, or zippers. With nickel being so common, a proper nickel detection method is important for those with nickel allergies. To address such issues, we will engineer and characterize E. colifor nickel sensitivity using the rcn promoter. The 2011 Lyon Biosciences team previously used this part in a cobalt detecting project, and they noted its nickel detecting ability. However, the nickel aspect of the part has not been characterized in the iGEM competition. Therefore, we hope to contribute meaningful characterization data for the rcn promoter while engineering nickel sensitive E. coli.

Austin UTexas

Location:	United States	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Friday - Room 306 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 134

Measuring the burden of synthetic constructs in the iGEM Registry

When a construct is added to a cell, resources are allocated towards expression of the construct. This creates additional cellular burden, making engineered bacterial populations less fit than the wild type. Over time, cells accumulate loss-of-function mutations within the construct, freeing cellular resources. These mutations increase cell fitness, prompting the mutation to sweep through the population. Therefore, the population cannot maintain the burden associated with the construct for a sustained number of generations. Our goal is to measure the growth rates of genetically modified cells to identify burdensome parts. We used the Ellis Lab's 'burden monitor' for E. coli to measure the burden of BioBricks from the iGEM Registry (Ceroni 2015). We transformed 500+ BioBricks into 'burden monitor' DH10B E. coli and assayed growth rate versus GFP expression rate. We identified burdensome parts by analyzing measurements with a pipeline of scripts, determining growth rate reduction percentages against GFP expression rates.

Baltimore BioCrew

Location:	United States	**Track**:	High School
Region:	North America	**Presentation**:	Sunday - Room 304 - 10:00 AM
Section:	High School	**Poster**:	HS Zone 2 - HS 56

Gut Wars

Antibiotics save lives by killing pathogens, but often kill non-pathogenic gut bacteria as well. These bacteria digest food, help the immune system, synthesize vitamins, and produce neurotransmitters. Antibiotics decrease bacterial diversity by 25%, which can lead to a range of health issues and increase the risk of future infection.Microbiome diversity is regulated and encouraged by Mucus Associated Functional Factors (MAFFs), a protein produced by B. theta bacteria. Antibiotics kill B. theta, thereby reducing MAFF production and creating a cycle that prevents a healthy gut.By introducing the MAFF-producing gene onto a plasmid, inserting this into E. coli, and then transplanting the E. coli into the gut, a microbiome could be regrown. Our bacteria will have a short life expectancy because of our xylose-dependent antitoxin, which inhibits growth once the xylose is metabolized. The MAFFs produced by these regulated E. coli will promote the reestablishment of a healthy microbiome.

BEAS China

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 210 - 9:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 23

AModularized & Smart & Safe Machine for Heavy Metal Bioremediation

Heavy metal pollution can be widespread in the city water supply, which is hard to be detected or eliminated by citizens. Our project is designed to solve both the detection and the remediation of heavy metal pollution in one system. Implementing the MerR and PbrR sensor proteins, as well as an amplifying module downstream involving TEV and CI434, the detection system can reliably output a zero-or-one signal on the presence of mercury and lead through GFP. We have also incorporated the curli and spytag-spycatcher mechanism in our remediation module. Such mechanism creates an interconnected biofilm of spycatcher 'sockets', on which metal-binding proteins can be attached to the surface of our engineered bacteria. We have applied this to maximize the surface area of reaction, which magnifies the remediation efficiency. Combined with our purification hardware, our product offers an affordable yet smart solution for heavy metal pollution.

BGU Israel

Location:	Israel	**Track:**	New Application
Region:	Asia	**Presentation:**	Sunday - Room 310 - 9:00 AM
Section:	Overgrad	**Poster:**	Zone 2 - 212

FlyGEM- The Trojan Mosquito

Life-threatening diseases such as Malaria, Dengue fever and Zika fever are caused by parasites transmitted through mosquitoes. Most of these diseases have no treatment or effective prophylaxis, and vector control is the preferable mode of action. However, traditional methods using insecticides are not efficient and an environmental hazard, indicating the need for an effective and eco-friendly solution. In the FlyGEM project, we took advantage of the Bacillus thuringiensis israeliensis (Bti), a gram-positive, spore-forming bacterium that produces insecticidal toxins and virulence factors that selectively target the larval mosquito stages. We genetically engineered a bacterium that expresses Bti toxin in the gut microbiome of adult mosquitoes. Mosquitoes fed by Bti-toxin expressing bacteria were not affected, however the bacteria are delivered to the eggs and the expressed Bti is toxic for the hatching and nearby larvae. Thus, our Trojan Mosquito can specifically target the larvae and reduce mosquito population to control mosquito-borne diseases.

BHSF ND

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 310 - 2:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 38

Digitalizing bistable module enable conditional suicide of engineered bacteria

Genetically engineered bacteria in science and industry bears the risk of intended stolen and unintended release to the environment. Such releases may interfere with the balanced microbial ecosystems before and even destroy the original ecological balance.To solve this problem, our team designed a digitalizing bistable module that can detect and prevent the stealing or release of engineering bacteria form labs or factories.We utilize the mutualbistable system that enable conditional suicide of engineered bacteria. To better function, we use a sensor to sense the change of external environment, a recombinase as a flip to form memory which could record the action of stealing or release, and DNase/toxic protein to decompose the functioning bacteria.

Bielefeld-CeBiTec

Location:	Germany	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Saturday - Room 311 - 11:30 AM
Section:	Overgrad	**Poster:**	Zone 3 - 245

Troygenics - The Odyssey to World Transforming Shuttles

Remember the trojan horse? With this trick Greeks snuck into Troy. Inspired by this story we engineered Troygenics, molecular trojan horses, that enter and transform eukaryotic cells.Eukaryotic pathogens including numerous fungi are a growing threat to crops, animals and humans. Common treatments lack specificity and are frequently overcome by resistances. In a novel mode of action, our Troygenics enter these pathogens via endocytosis and deliver a Cell Death Inducing System (CeDIS). Troygenics consist of modified M13 coat-proteins assembled by Escherichia coli and contain ssDNA encoding the specific CeDIS based on Cas13a. Pathogen-specific ligands fused to the coat proteins enhance uptake via endocytosis. We incorporated sophisticated biosafety mechanisms to achieve selective transformation of the targeted pathogen. Among other methods, we demonstrated the functionality of the Troygenics applying a self-developed low-cost microfluidic system.In conclusion, we engineered an innovative platform technology customizable to target various eukaryotic pathogens.

Bilkent-UNAMBG

Location:	Turkey	**Track:**	Therapeutics
Region:	Europe	**Presentation:**	Friday - Room 304 - 9:00 AM
Section:	Undergrad	**Poster:**	Zone 3 - 224

PRISMO - Probiotic Insulin Secreting Modified Organism

Diabetes is a metabolic disease that affects over 422 million people globally and this number is increasing rapidly. Diabetes results in hyperglycemia due to defects in insulin secretion, insulin action or both. This year the Bilkent UNAMBG team aims to present an alternative solution to diabetes using 'Living Therapeutics'. We plan to engineer a bacterium that will colonize itself in the gut and will secrete single-chain insulin (SCI) analogs when induced. We designed 8 different SCI constructs among which we will characterize and select the most effective analog. These SCI analogs will be displayed on the cell surface via Ag43 autotransporters along with TEV proteases which will cleave the SCI analogs. Cell-penetrating peptides will be fused to SCI analogs to induce penetration through the epithelium of the gut to the bloodstream. We envision an easier and more affordable diabetes treatment with PRISMO.

Bio Without Borders

Location:	United States	**Track:**	High School
Region:	North America	**Presentation:**	Sunday - Room 309 - 9:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 36

(Shhhhhh!)Silencing genes in Diaphorina citri to Combat Huanglongbing Disease in Citrus

Huanglongbing (HLB) is an infection of the bacterium Candidatus liberibacter asiaticus (CLas) that compromises the immune system of host citrus plants. It is introduced to the citrus plant when the asian citrus psyllid, Diaphorina citri feeds on the plant's sap. CLas migrates from insect gut into the phloem through the psyllid's saliva. Pesticide and antibiotic have disastrous long term effects in the form of ecological destruction and creation of antibiotic resistant soil bacteria. We improved upon the work of the 2017 TecCEM team, using a modification of their system to silence critical psyllid development genes using siRNA. We targeted arginine kinase and superoxide dismutase, and we explored the use of whole bacteria instead of purified siRNA to treat plants. We envision delivery via a trap that contains the RNase minus E.coli/siRNA-producing cassette. We hope to slow down the spread of CLas through the reduction of psyllid populations.

Bioriidl Somaiya

Location:	India	**Track**:	Foundational Advance
Region:	Asia	**Presentation**:	Friday - Room 306 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 19

Steriport - Making sterilisation and dispensing system portable

To this date, many research and developments have been implemented but the primary source of development is still lagging, which is our autoclave. So we developed, steriport, a system that can sterilize and dispense the media within just 8-10 mins. The best thing about our model is that it's very handy in use and also portable. The sterilization is carried out by the action of AMPs such as Lantibiotic nisin-A, AlbB, and sporulation killing factor. These all are mass-produced by the use of chassis Escherichia coli BL21 DE3, and will mainly target on bacteria contaminants. For fungal contaminants, we make use of endophytes extracted from Holy Basil and Indian lilac. The main feature is the Ohmic heating and UV type C (inactivate or kill the contaminant). While, UV-C effects on human skin aren't harmful, but only irritable to the eyes, for that reason, we coated our UV chamber with acrylic.

BIT

Location:	China	**Track**:	Environment
Region:	Asia	**Presentation**:	Saturday - Room Ballroom A - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 111

Microbial sensor coupled with microfluidic chip and smartphone detects oxidative damage effect

Radiation or various unknown chemical reagents may lead to genetic diseases. Detection methods based on analytical chemistry and biology are mostly tests for DNA damage products and damaged intermediates. This passive assay does not allow identification and evaluation of the DNA damage capabilities of unknown compounds.We constructe a microbial sensor that can be used to identify oxidative damage reagents. A promoter which is sensitive to oxidative free radicals is screened to respond to the signal and regulate the expression of fluorescent proteins. using ratio of fluorescence to od to judge whether it is an oxidative damage reagent and it's strength. We designed a microfluidic chip with mixing channel and ratchet structure for the culturing and testing,which greatly reduced the amount of experimental operation. We have independently developed a miniaturized instrument based on a small program of smart phone,which is can be used for fluorescence detection and cell morphology observation.

BIT-China

Location:	China	**Track**:	New Application
Region:	Asia	**Presentation**:	Friday - Room 306 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 262

Achieved Transcription Management (ATM)

Engineering microbial cells to produce fine chemicals is a sustainable and environmental-friendly way. However, low yield from microbial production hinders its industrial application.Resources within microbial cells such as carbon-source from cell medium are utilized both for cell-growth and product-synthesis. Traditional ways to balance cell-growth and product-synthesis involve using inducers to initiate product-synthesis, which is time-consuming and expensive for large-scale production.To allocate resources for increased yield and decreased cell-medium cost, we have developed an intelligent system 'Achieved Transcription Management'(ATM), which allocates intracellular transcriptional resources to growth-related genes in early stages of fermentation and switches them to product-related genes after a high cell density is achieved. Under guide of mathematical models, the proper cell density is responded by QS circuit expressing genes σ-factors and T7-RNA-polymerase. Them control transcription of exogenous genes to produce lycopene. ATM system is self-responsive and could replace inducers to lower cost of fermentation and manual

BM-AMU

Location:	China	**Track**:	Foundational Advance
Region:	Asia	**Presentation**:	Friday - Room 311 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 15

Building a bridge from phenotype to landscape

Cell landscape, a collection of biological bigdata of cell that integrates genome, transcriptome, proteome, metabolome and immune group, which is the basis for understanding the complex system of cells. However, existing techniques for acquiring cell landscapes have defects such as complicated operation, time consuming, and destruction of cells. Our goal is to accurately reflect the landscape of cells by detecting several simple indicators such as fluorescent phenotypes. After in-depth communication, the epithelial-mesenchymal transition (EMT) process of embryonic stem cells is used as our research vector. Our experiments focused on giving cells specific and regulatable fluorescent phenotypes, controlling EMT processes, monitoring fluorescence changes and collecting RNA omics data.

BNDS China

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 310 - 3:00 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 33

A Dream of Red Lacquer

Lacquer and carmine (a red dye) play important roles in the preservation and production of traditional Chinese lacquerware. Currently, however, attaining raw lacquer requires complicated, harmful manual extraction from Rhus verniciflua (lacquer tree), and the production efficiency of carmine from cochineals is low. We utilize E. coli to synthesize laccase and todC1C2ABD, four enzymes that can convert hexadecylbenzene to urushiol, the other functional component of raw lacquer aside from laccase; in S. cerevisiae, we aim to produce carminic acid, the major red component of carmine. The laccase, urushiol, and carminic acid are mixed with several cost-effective ingredients, resulting in an artificial red-colored lacquer that can be easily applied in industrial and domestic contexts. This synthetic biological method avoids the potential danger due to unknown natural components and expands the potential of inheriting and further developing lacquerware culture.

BNU-China

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Sunday - Room 306 - 11:00 AM
Section:	Undergrad	**Poster:**	Zone 1 - 13

A Synthetic Leanness-promoting Intestinal Microbe (SLIM)

Obesity has become an increasingly severe health problem globally. While its relation to various diseases has been constantly discovered, few countries have succeeded in harnessing the deterioration of the problem. This year, BNU-China proposes to develop a synthetic intestinal microbe which promotes leanness by enhancing catabolism of both assimilated and unassimilated fat using two combined synthetic pathways, one leads to overproduction of acetic acid, which as a signal, promotes consumption of white fat tissue; the other enhances β-oxidation of excessive higher fatty acids consumed by human, which would otherwise be absorbed. A bilateral switch is put in control of the pathways, conferring the microbe an exquisite trait to express either pathway at an optimal time according to the changing chemical environment inside digestive track. Additionally, two safety modules are introduced: one enables the host to terminate the engineered bacteria whenever they want; the other prevents contamination of the outside environment.

BOKU-Vienna

Location:	Austria	**Track:**	Diagnostics
Region:	Europe	**Presentation:**	Friday - Room 312 - 10:00 AM
Section:	Overgrad	**Poster:**	Zone 1 - 65

Mycolactone Diagnostics - A Novel Approach to Diagnose the Neglected Tropical Disease Buruli Ulcer

Buruli ulcer is a neglected tropical disease which manifests in ulcers and may lead to lasting skin and bone deformations unless detected and treated early. Current diagnostic methods are time-consuming and barely available at the point-of-care in many endemic regions in Africa and the Americas, as they require sophisticated laboratory equipment and highly trained personnel. As a solution, we propose a novel, easy-to-use diagnostic test detecting mycolactone, the toxin excreted by the causative agent Mycobacterium ulcerans, in a patient's sample. The molecular mechanism is based on a riboswitch which, in the presence of mycolactone, specifically induces chromoprotein expression in an engineered Escherichia coli strain, generating a simple visual read-out. As an alternative to GMOs, the test may also be used as cell-free system. After expert consultations, an instruction manual was designed to ensure proper and safe use, thus rendering the test a quick and efficient tool for diagnosing Buruli ulcer.

Bonn

Location:	Germany	**Track:**	Energy
Region:	Europe	**Presentation:**	Saturday - Room 309 - 5:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 143

Optoplant: Lighting up your way to a better future

Creating a plant that can glow in the dark is not a unique project; it has been tried before and not with much success, which is why we are taking a more conservative approach to this project: By testing various parts of gene constructs and bioluminescent systems we can quantify and show the best parts available for someone to make a functional glowing plant.The parts we are testing in a bacterial chassis (E. Coli) and then in a plant chassis (Nicotiana Benthamiana) are Promoters, Mutated LuxAB Complexes, Riboswitch, and Fluorescent Reporter Genes. By using IIS Restriction we can interchange any part of a gene construct with relative ease allowing us to quickly test and compare various constructs due to the modular nature of our cloning method.Optoplant will provide the first basis for others working with bioluminescence systems and plant engineering.

Botchan Lab Tokyo

Location:	Japan	**Track:**	Environment
Region:	Asia	**Presentation:**	Saturday - Room 312 - 9:00 AM
Section:	Undergrad	**Poster:**	Zone 3 - 237

Search for Radioresistance ~the Unlimited Possibilities of Radioresistant E. coli~

In 2011, Great East Japan Earthquake causes the nuclear accident in Fukushima Daiichi Nuclear Power Plants. This is why a large amount of radiation was emitted. Many researchers are aiming to solve the problem and have proposed various solutions. However, even today, radioactive contamination has been a serious problem in Japan which we need to solve immediately. From this circumstance, this year, we aim to give E. coli radiation resistance.By inserting three genes that are related to high DNA repair ability and oxidative stress tolerance from one of radiation-resistant microbes, we search for more effective way to make E.coli survive in the environment of high radiation dosage. If we combine this E.coli with other technologies, we can develop innovative solutions to purify polluted water, collecting rare metal, and so on. High DNA repair ability can also be used to improve cloning technology(in Vivo E.coli Cloning).

British Columbia

Location:	Canada	**Track:**	Food and Nutrition
Region:	North America	**Presentation:**	Sunday - Room 309 - 2:30 PM
Section:	Undergrad	**Poster:**	Zone 1 - 53

Paralyte: The discovery of a transcription-based biosensor for the detection of paralytic shellfish toxins

With the advent of climate change, there are growing concerns over harmful algal blooms (HABs) and their impact on vital food sources, especially shellfish. Numerous rural and Indigenous communities depend on shellfish in their everyday diet and have deep cultural connections with it. Saxitoxin, a potent neurotoxin produced during HABs, accumulates in shellfish and has caused fatalities in Canada, leading to strict harvesting regulations. Despite this, current detection techniques are time-consuming and rely on expensive laboratory equipment. To overcome this, UBC iGEM is seeking to discover a novel saxitoxin-induced promoter for the construction of a biosensor. Our approach includes Substrate-Induced Gene Expression (SIGEX) and screening of a pre-existing E. coli promoter library. The project serves as a gateway for the development of accessible, on-site detection of shellfish toxins. This device can empower coastal communities, and encourage data collection for enhanced understanding of the impact that HABs have on our lives.

BrockU

Location:	Canada	**Track**:	New Application
Region:	North America	**Presentation**:	Saturday - Room 210 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 66

Lights, Camera, Flip!

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 spatiotemporal 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.

BrownStanfordPrinctn

Location:	United States	**Track**:	Manufacturing
Region:	North America	**Presentation**:	Saturday - Room 312 - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 9

Towards an Astropharmacy

Astronauts rely on regular shipments of medication from Earth because drugs degrade; this is an unsustainable practice for long-term manned missions. Our solution is the 'Astropharmacy' □ an on-demand production system for protein-based drugs. The Astropharmacy comprises diagnostics, drug production, and purification. Within diagnostics, we enhanced paper-based microfluidics by innovating hydrophobic protein-based ink to 3D print microfluidic channels, improving resolution from wax-based channels. We designed genetic templates to produce insulin, teriparatide, and hG-CSF using cellular systems to harnesses the speed of VmaxTM, long-term viability of Bacillus subtilis, and production capability of E.coli, and commercial and lab-developed cell-free systems for their adaptability. Lyophilization techniques were applied to preserve the stability of the Astropharmacy at ambient temperatures. Drug production and purification were implemented on 3D-printed expression and PDMS purification microfluidic chips. The construction of the Astropharmacy was guided by insight from industry experts, astronauts, and doctors.

BSC United

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 313 - 9:00 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 69

MINILOSS (MIcrofluidic orgaN chIp for bLOod glucoSe Stabilization)

While diabetes mellitus afflicts hundreds of millions of people in the world, combination of dietary control, physical exercise, and insulin injection is the conventional approach for diabetic treatment. The patients are annoyed by ceaseless torture of blood sampling and/or insulin injection on daily basis. Our project 'MINILOSS' (MIcrofluidic orgaN chIp for bLOod glucoSe Stabilization) commits to an innovative, painless, bio-based approach for diabetic treatment. Ordinary people have functional pancreas to secrete insulin to metabolize glucose, while diabetics need insulin injection. Our ultimate goal is to enable probiotic bacteria within the GI tract to sense glucose level and to secrete insulin by the synthetic bacteria. Currently, we have accomplished an in vitro model to illustrate such a process. The model incorporates multidisciplinary knowledge of synthetic biology, microfluidics, electrochemistry, and electrical engineering to provide an 'organ-on-a-chip' for the simulation of automatic regulation of glucose level for diabetic patients.

BUAP Mexico

Location:	Mexico	**Track:**	Environment
Region:	Latin America	**Presentation:**	Sunday - Room 312 - 9:30 AM
Section:	Undergrad	**Poster:**	Zone 1 - 80

PlastiCO□ - Producing bioplastics from CO□ and vegetable waste

Nowadays the excessive production of CO□ is causing a phenomenon called ocean acidification (OA) which combined with tons of plastics in the ocean are both main problems in the marine environment.Through genetically transformation, E. coli BL-21 bacterium will combine the capability of plants to get CO□ from the marine environment (decreasing the OA) and the skill from some bacterium to degradate of vegetable waste in order to have sugar source.Both processes are vital in order to produce great pyruvate quantities to get polyhydroxybutyrate, which is used to produce bioplastics that could replace the prevailing polymer .For maintaining the Pyruvate production and photorespiration in the highest and lowest level, respectively we will design a system which works under anaerobic conditions and repress the aerobic metabolism using arcA protein and for measuring the pyruvate production we design a biosensor.

BUCT-China

Location:	China	**Track:**	Environment
Region:	Asia	**Presentation:**	Friday - Room Ballroom A - 4:30 PM
Section:	Overgrad	**Poster:**	Zone 2 - 169

No title

No abstract

Bulgaria

Location:	Bulgaria	**Track:**	Therapeutics
Region:	Europe	**Presentation:**	Saturday - Room 313 - 2:30 PM
Section:	Undergrad	**Poster:**	Zone 3 - 248

Peptidator P-800: Pathogens, you've been terminated!

Pathogens, you've been terminated!Our novel synthetic platform for high throughput isolation and characterization of peptides with antimicrobial properties will serve as The Terminator for multi-resistant bacterial pathogens.We are planning on using the available genomic and meta-genomic sequencing data as a source of novel peptide sequences that can be used instead of antibiotics. To identify such elements, we will be using different versions of the BLAST algorithm and known antimicrobial peptides as quarries. The next step would be to have these exact sequences synthesized as an oligonucleotide pool and cloned like an expression library in E.coli. Last but not least, we will be testing the activity of this library against a selected group of indicator strains that represent most of the major important human and animal pathogens as to find the perfect Peptidator!

Calgary

Location:	Canada	**Track**:	Food and Nutrition
Region:	North America	**Presentation**:	Friday - Room 313 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 166

yOIL: an all-encompassing solution to the green seed problem

Excess chlorophyll in canola seeds, an issue known as green seed, requires expensive and harmful methods during oil processing.iGEM Calgary designed a protein-based emulsion system as an alternative to the current environmentally-detrimental method. A chlorophyll binding protein was emulsified and used to remove excess chlorophyll from green oil. Phase diagrams and molecular dynamic simulations were used to optimize our emulsion system, and genetic algorithms were used to engineer the chlorophyll binding protein to have improved binding capabilities and stability. Captured chlorophyll was repurposed into pheophorbide, a cytotoxic photosensitizer with antifungal properties. A novel universal spacer was developed via interaction and homology modelling, which enabled purification of the large plant enzymes required for the production of pheophorbide. This project addressed multiple challenges found within canola production and processing. Our solution has the potential to improve current practices and potentially introduce a new market stream for the canola industry.

Canterbury Chch NZ

Location:	New Zealand	**Track**:	Food and Nutrition
Region:	Asia	**Presentation**:	Saturday - Room 304 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 264

The Milk Protein Project

The rise of cellular agriculture in New Zealand has inspired us to develop novel strategies to increase the value of milk proteins that will, in the future, be produced using biotechnology. Cow's milk is categorized as one of the main 8 allergens in the western world. Beta-lactoglobulin (BLG), a protein found in both bovine and caprine milk, is a key allergen in the whey fraction of milk. Allergy to proteins like BLG, occurs due to specific proteins keys (amino acid epitope sequences) which initiate an immune response and/or because the protein cannot be easily digested by the body. Our project aims to utilize biotechnology to decrease the allerginicity to milk proteins like BLG. To achieve this, we have produced genetic variants of BLG and will transform E. coli, 'hijacking' bacteria to synthesize the variant-proteins. Subsequently, we will purify and run enzyme-linked immunosorbent assay (ELISA) in triplicate to screen for allerginicity.

CAU China

Location:	China	**Track:**	Environment
Region:	Asia	**Presentation:**	Saturday - Room 302 - 4:30 PM
Section:	Overgrad	**Poster:**	Zone 1 - 58

E.SPA□The E.coli cell factory that degrades Stalks and producesAstaxanthin

China produces billions of tons of stalks per year. The crop stalks are abundant in cellulose, which would be an efficient carbon source. However, due to high utilization cost, low added value and low industrialization, the bulk of stalks are burned, which wastes resources and causes severe environmental pollution. Astaxanthin, one of the strongest antioxidants in nature, has broad market prospects and high commercial value, providing us with an ideal destination of stalks utilization. In our project, E. coli cells are engineered to consume cellulose as the carbon source and produce astaxanthin. To achieve this goal, three cellulose-degrading enzymes are anchored to E. coli cells' outer membranes, while an astaxanthin synthesis pathway is constructed by transferring six additional enzymes to E. coli cells. In this way, we can transform stalks into astaxanthin in only one step, which may offer novel ideas for the reutilization and conversion of the biomass.

CCA San Diego

Location:	United States	**Track:**	High School
Region:	North America	**Presentation:**	Friday - Room 304 - 3:00 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 9

HORIZON 2.0: Clean Energy from Crude Oil Degradation

Contamination of aquatic and terrestrial environments with crude oil is a global issue. Crude oil contains polycyclic aromatic hydrocarbons (PAHs), compounds that are difficult to degrade and environmentally toxic. To combat these compounds, a novel methodology was designed for PAH and other hydrocarbon bioremediation from various catabolic pathways upstream of innocuous intermediates. Resulting intermediates are ultimately employed anaerobically to convert into dissolved hydrogen fuel. Hydrogen synthesis is also fueled by pathways that metabolize n-chained hydrocarbons. HORIZON 2.0 also utilizes pathways for the degradation of salicylate and phthalate, compounds that resulted from previous PAH degradation constructs but are unusable by E. coli. To modulate between the various conditions for degradation and synthesis, a positively regulated magnesium riboswitch and novel synthetic CRISPRi operators under riboswitch regulation were designed for use as synthetic operators. Ultimately, this project allows broad spectrum transformation of PAHs and other hydrocarbons within crude oil into usable energy.

CCU Taiwan

Location:	Taiwan	**Track**:	Diagnostics
Region:	Asia	**Presentation**:	Saturday - Room 302 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 210

ASFAST: Rapid early detection of African Swine Fever

African Swine Fever Virus (ASFV) is a serious epidemic disease worldwide. The ease of infection- and high mortality rate has caused serious market imbalance. ASF has spread throughout Asia, soTaiwan is surrounded by epidemic regions. Recognizing this problem, we created 'ASFAST'.ASFAST combines the CRISPR Cas system with PicoGreen fluorescence signal transduction. Weuse Cas12a protein with crRNA to recognize the ASFV p72 capsid protein sequence. When theCas12a protein is activated, a fluorescent signal will be detected by our sensor. ASFAST candetect the virus within 7 days of infection, which means during the incubation period. Based on this advantage, we plan to develop an early detection system as part of a routine health check for non-epidemic regions. After the test, the ASFAST device will immediately send the data to a cloud database so the government can monitor the results in real time.

Chalmers-Gothenburg

Location:	Sweden	**Track**:	Environment
Region:	Europe	**Presentation**:	Friday - Room 210 - 3:00 PM
Section:	Overgrad	**Poster**:	Zone 3 - 228

DePCB: Engineered yeast for degradation of PCB

Our project aims to use synthetic biology to develop a method for bioremediation of polychlorinated biphenyl (PCB) contaminated soil. PCBs are a very persistent group of pollutants that bioaccumulate in the fatty tissues of many animals, and although their use was prohibited long ago they still remain a problem. To solve this, we attempt to engineer Saccharomyces cerevisiae with genes from several bacteria encoding enzymes that are able to both dechlorinate and degrade the compounds. The designed system uses two separate yeast strains, one which can use the enzyme PcbA5 to dechlorinate PCBs and another which hosts eight enzymes from the Bph-pathway which can be used to degrade the biphenyl skeleton. The envisioned implementation of this system would allow us to remove PCBs from both soil and water in an efficient way, ultimately removing this long-lasting problem from the environment.

CMUQ

Location:	Qatar	**Track**:	Diagnostics
Region:	Asia	**Presentation**:	Sunday - Room 210 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 1 - 78

CASPRE - Preliminary Genetic Testing Kit

In an effort to reduce the inequality in global healthcare, increase the efficiency of labs, and minimize biohazards, our team developed CASPRE; a synthetic biology kit that provides preliminary genetic testing for carriers of recessive traits. CASPRE's biological mechanism utilizes CRISPR-Cas12a protein, specifically- designed guide RNA (gRNA), and fluorescing reporters to identify the presence of a disorder-causing SNP. Upon the extraction of the DNA from a saliva sample, Cas12a scans the DNA searching for a complementary sequence to the gRNA. If complementary binding occurs, a reaction complex forms and triggers an indiscriminate cleavage activity. Through this, a single-stranded DNA linking the reporter and its quencher degrades and allows the emission of fluorescence. Then, CASPRE's developed, hand-held device and user-friendly application work in tandem to detect and interpret the emitted fluorescence producing a +/- diagnoses.Within a few minutes, we become a step closer to a more aware community.

Concordia-Montreal

Location:	Canada	**Track**:	Diagnostics
Region:	North America	**Presentation**:	Friday - Room 311 - 3:30 PM
Section:	Overgrad	**Poster**:	Zone 1 - 24

Quantifen: Non-invasive wearable biosensor for fentanyl detection

Fentanyl, an opioid painkiller, is the leading cause of accidental opioid overdose as many recreational drugs are unknowingly laced with it. Our solution: Quantifen! Quantifen is a non-invasive wearable biosensor adapted for fentanyl detection in sweat. Taking the form of a temporary tattoo consisting of conductive ink layers and cellular-functionalized iontophoretic hydrogels, biological detection is converted into electrical output. This output is transferred as data to our app, warning the user of fentanyl consumption via mobile alerts or by contacting emergency services. The biosensor consists of a genetic circuit which produces glucose oxidase (GOx) in response to fentanyl binding to receptor protein FEN21. GOx undergoes electrochemical reactions, creating current which is carried via screen-printed conductive inks to a printed circuit board (PCB) in the wearable device; it then communicates with the user's smartphone. The biosensor can be adapted for detection of other drugs or small molecules due to its modularity.

Cornell

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Friday - Room 313 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 42

reHAB: A comprehensive system for microcystin detection and remediation

Every year, streams and rivers across the world are stricken with algal blooms. While already negative for the ecosystem, some are even more deadly. These harmful algal blooms (HABs) create microcystins, toxic chemicals that are long-lasting and contaminate drinking and irrigation systems. Our system has two parts: a biological sensor to detect the presence of microcystines and a filter for environmental remediation. Our sensor consists of an RNA aptamer conjugated to gold particles, which specifically binds our target microcystin-LR and produces a colorimetric change. Our filter is comprised of a specific cassette of enzymes endogenous to Sphingopyxis sp. It consists of a packed-bed-reactor, where we pass water through a chamber containing our engineered strain immobilized on alginate beads. By putting this system on a device that can traverse the span of lake or river, we hope this will stand as a major improvement in the detection and treatment of HABs.

Costa Rica

Location:	Costa Rica	**Track**:	Therapeutics
Region:	Latin America	**Presentation**:	Friday - Room 313 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 84

DiffEASY

DiffEASY seeks for the creation of an innovative method to treat Clostridium difficile infection. This bacteria is an opportunistic pathogen with a broad antibiotic resistance and increased fitness. In Costa Rican hospitalarian system, C. difficile is considered an endemic disease. Current treatments against this bacteria are based on the use of antibiotics or faecal transplants. The latter, potentially disgusting for patients. As for the antibiotics, only few are effective and, after treatment, patients can present a recurrent infection. Therefore, there is an urge to find alternative treatments to CDI.We propose a system based on the insertion of genetic constructs into Lactobacillus casei, which will act as a probiotic. This organism will be engineered to acquire the capacity to receive a virulence signal (characteristic of C.difficile quorum sensing) and give as response the secretion of a highly specific lysis protein, avoiding the problems and displeasure of current treatments.

CPU CHINA

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Saturday - Room 313 - 3:30 PM
Section:	Overgrad	**Poster:**	Zone 1 - 52

New therapeutic strategy for tuberculosis based on Immune-like cells

Tuberculosis is the leading cause of death from an infectious agent. Since conventional methods are more and more difficult to deal with this disease, we put forward a new therapeutic strategy for treating Mycobacterium Tuberculosis (Mtb) infection based on Immune-like cells. In our project, Toll like receptor (TLR) 1/2 and CD14 molecules were expressed on the surface of HEK 293 cells to recognize specific antigens of Mtb. Then, stimulation of TLRs lead to the activation of downstream NF-κB signaling pathway. The NF-κB induced promoters were designed to express granulysin and microRNA hsa-let-7f to respectively eliminate Mtb in blood circulation and macrophages. In order to deliver microRNA into Mtb-infected macrophages, modified cells secrete targeted exosomes containing microRNA after being stimulated with Mtb. In the future, by replacing TLRs and downstream effectors, our 'immune-like cells' could target different pathogens, thereby serving as a novel infectious disease treatment strategy in post-antibiotic era.

CSL Pittsburgh

Location:	United States	**Track:**	High School
Region:	North America	**Presentation:**	Friday - Room 309 - 9:00 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 66

The effects of insecticide-resistant microbiota in Apis mellifera

The honeybee, Apis mellifera, is an important pollinator that is suffering from a crisis called Colony Collapse Disorder. This causes drastic declines in bee populations, disrupting wild ecosystems and global agriculture. In this study, a primary CCD culprit, imidacloprid, is detoxified via paratransgenesis. Using this technique, the midgut bacteria of the bee are engineered to express a cytochrome p450, rendering the bee resistant to the insecticide. By attaching the reporter phoA to the insecticide-resistance gene, CYP6AY1, found in Nilaparvata lugens, the expression of the protein can be monitored. The signal sequence pelB is used to secrete the protein into the bee gut, where it can metabolize the imidacloprid. Once this system successfully functions in-vitro, the transgenic bacteria can be introduced to the bee orally and monitored for significant effects. We hypothesize that this treatment will increase the survival rate of A. mellifera when exposed to imidacloprid.

CSMU Taiwan

Location:	Taiwan	**Track:**	Diagnostics
Region:	Asia	**Presentation:**	Saturday - Room 311 - 9:00 AM
Section:	Undergrad	**Poster:**	Zone 3 - 239

Detection, new treatment, and prevention for influenza

Influenza spreads around the world in a yearly outbreak, resulting in 3~5 million cases of severe illness and 250,000~500,000 deaths. The recent antibody-type flu screening is approximately 60% accurate and only distinguishes the basic types of influenza. Antigenic drift and shift make the prediction of the upcoming epidemic subtype of influenza a challenging task. Antibodies take time to be developed, but this slow yet potent remedy can't meet its urgent demands. To solve this problem, we utilize aptamer which is known for its specific recognition of unique proteins of influenza viruses. By improving the conventional method, we developed a rapid detection device which effectively targets influenza. Furthermore, we have also managed to exploit the aptamers to inhibit virus infection. Our project not only seeks to provide a lower cost, fast production and highly-stable detection tool, but also has strong potential for new treatment and prevention.

CSU CHINA

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Sunday - Room 310 - 3:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 116

TNBC Assasin

Breast cancer is the second most common cancer in women. Despite success in several clinical trials, treatments remain limited by the high heterogeneity and invasiveness especially in triple negative breast cancer(TNBC). Based on these characteristics, our team has characterized a gene circuit with three modules. Controlled by TNBC-specific promoter 1, module 1 includes a miRNA binding site(BS) and a transcription factor which drives Module3 --- expression of a fusion protein composed of HIF1-αoDDD and yeast cytosine deaminase (yCD) working under hypoxia conditions. Module 2 includes several sponge-like domains effectively down-regulating specific miRNA when promoter 2 is driven. Supposing the miRNA is highly expressed in the normal cells and low in most cancer cells, this circuit could trigger highly selective cytotoxicity of cancer cells. Once optimized, our design could be applied to current treatments, allowing for a more powerful therapeutic effect with a comparatively low risk.

CSU Fort Collins

Location:	United States	**Track**:	Therapeutics
Region:	North America	**Presentation**:	Friday - Room 302 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 206

Sense and Destroy

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 more recently, 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 its population density and become virulent and break away from the biofilm. Our system will hijack the system and trigger production of lysostaphin that will specifically target S. aureus and act as a kill mechanism. This system will be able to safely treat S. aureus and avoid perpetuating the problem of creating new resistant species.

CU

Location:	Egypt	**Track**:	Environment
Region:	Africa	**Presentation**:	Friday - Room 309 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 174

(Sea-) A system to hunt and bind ions from the sea

One of the available solutions to water scarcity is desalination, but it has drawbacks of being energy-intensive, costly, and bad for the environment. Biological desalination might be a better method that grants no harm to the environment.Reducing the concentration of salts (especially NaCl) in the water is the main objective. CU team is working on two approaches: Accumulating the salt inside the microbial cell by improving the sequestration of sodium and chloride ions and modifying the cells not to release the salts, and overcome the toxic effect of salts on the cell by expressing osmoprotectant and by increasing vacuoles uptake of the salts.The second approach is to synthesize Cell-free Na and Cl binding proteins to avoid the drawbacks of introducing modified microorganisms into the water. The system is meant to be integrated as a pre-treatment step in the current desalination infrastructure.

CU-Boulder

Location:	United States	**Track**:	Therapeutics
Region:	North America	**Presentation**:	Saturday - Room 310 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 144

Antibody 'Off' Switch

Monoclonal antibody (MAb) therapies are a new frontier of pharmaceuticals used for treating a variety of illnesses such cancer. However, the administration of MAbs may be associated with an overactive immune response that cause extremely dangerous side effects. To help solve this problem we created an antibody kill switch in which a small molecule can quickly turn the antibody 'off' in the body and mitigate these side effects.Using computer protein modeling, we engineered an antibody with two compartments, the first consists of the variable antibody domains while the second is our kill switch. This kill switch region is AraC, a bacterial transcription factor that forms a homodimer that dramatically changes its dimer orientation when bound to the small molecule arabinose. In our design, when arabinose binds the AraC compartment, it pulls apart the homodimer, rendering our antibody nonfunctional. This concept could create a new generation of safer monoclonal antibodies.

DNHS SanDiego

Location:	United States	**Track**:	High School
Region:	North America	**Presentation**:	Sunday - Room 312 - 5:30 PM
Section:	High School	**Poster**:	HS Zone 2 - HS 70

Optimizing Efficiency of PETase Mutants for Solution to Plastic Pollution

Today, approximately 269,000 tons of plastic is floating in open ocean. Using E. coli transformed with plasmids expressing PETase, an enzyme from Ideonella sakaiensis that degrades polyethylene terephtalate (PET), this project's purpose was to develop a more thermostable and efficient enzyme to combat this microplastic pollution. Nine E. coli strains were engineered, each with unique mutations to alter the PETase activity and thermodynamic properties. Growth assays were conducted at different temperatures, with and without the presence of the PET substrate. Protein expression analysis of the mutants revealed a band for every strain at approximately 31 kDa, the expected size of PETase. Using a plate reader, absorption of the samples was measured and peaks at 260 nm were compared to detect the presence of MHET, a downstream product of PET degradation. With success, a faster and more efficient PETase enzyme could eventually be the solution to end the plastic pollution problem.

DTU-Denmark

Location:	Denmark	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Sunday - Room 302 - 9:30 AM
Section:	Overgrad	**Poster:**	Zone 1 - 61

LEAP - Library of Engineered Aspergillus Promoters

Our modern world depends upon the production of enzymes and biopharmaceuticals from microorganisms. Some of the most important, yet underappreciated, of these organisms are filamentous fungi. Despite their biological and economical value, the genetic toolbox for filamentous fungi is underdeveloped, something that must be addressed in order to use them as efficiently as common model organisms such as Escherichia coli and Saccharomyces cerevisiae. Therefore, we have taken it upon ourselves to develop a library of synthetic promoters that offers rich choices for stable, predictable, and tuneable expression at various scales, from the microtiter plate to the industrial fermenter, across the Aspergillus genus. These promoters are based on sequences from all publicly available Aspergillus genomes and modelled through a procedure that can be replicated by others for any taxonomic group. Furthermore, we have included a variety of standard parts for Aspergillus niger, thus expanding the possibilities for future iGEM teams.

Duesseldorf

Location:	Germany	**Track:**	Food and Nutrition
Region:	Europe	**Presentation:**	Friday - Room 310 - 4:30 PM
Section:	Overgrad	**Poster:**	Zone 2 - 191

SynMylk - an eco-friendly synthetic cow's milk to save the environment

Our project is the production of the natural components of cow's milk using methods from synthetic biology to modify microorganisms. This solution can provide the world with milk without risking the environmental damage caused by massive animal farms, while providing an authentic alternative. This lactose-free milk will be available to a larger number of people around the world.The first step to creating our SynMylk is the production of the components of cow's milk that the chemical industry cannot provide without using animal products. These components are the milk's proteins and lipids.We modified Bacillus subtilis, Pichia pastoris and the photosynthetic cyanobacterium Synechocystis sp. PCC 6803 to produce the milk proteins heterologously.The synthesis of lipids is enhanced by overexpressing enzymes that are bottlenecks in Synechocystis' natural fatty acid production. Heterologous enzymes are also expressed to specifically obtain certain lengths of lipids, which are not naturally produced.

DUT China A

Location:	China	**Track**:	New Application
Region:	Asia	**Presentation**:	Sunday - Room 310 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 7

Cell in CELL: Encapsulation of Living CTCs using DNA Hydrogel CELL

Living circulating tumor cells (CTCs) as escaping pioneers of tumor cells in the blood cause cancer metastasis. In order to address the difficulties on recognition, visualization, and capture of living CTCs with high purity and integrity, we construct a multifunctional DNA hydrogel like a prison CELL capsuling CTCs, and defined this new platform as 'cell in CELL' (CiC).CiC contains 3 key components: i) the fluorescence-labeled ssDNA aptamers for specifically targeting the receptors of CTCs and visualizing them; ii) once successfully targeting CTCs, the ssDNA aptamers will expose the sticky end further for triggering the adhesion of sticky-end pairing ssDNA; iii) the pairing ssDNA can induce rolling circle amplification, subsequent multi-primed chain amplification, making the formation of CiC around CTCs. Finally, CiC can enlarge CTC size for centrifugal isolation and meanwhile keep their bioactivity. In this work, we achieve a feasible and economical CiC for clinical CTCs-capture and analysis.

DUT China B

Location:	China	**Track**:	New Application
Region:	Asia	**Presentation**:	Friday - Room 302 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 68

Bio-microrobot: A Light Driven Reinhardtti (BALDR)

Photoautotrophic biological cells are promising actuators to perform transportation and delivery tasks, due to smaller size, power-free and wireless communication. However, motions of these biological cells could not be precisely controlled, and direction-oriented movement has not yet been realized. To make the locomotion of the motile cells in a controlled way, here, we are intended to make the movement of Chlamydomonas reinhardtii, a unicellular eukaryotic green motile microalga, in a precisely controlled way. The movement of robotize Chlamydomonas is activated by blue fluorescence of Renilla Luciferase in vivo, which was controlled by red light through rational design of PhyB and Pif as signal-trigger. Our work expanded the spectral palette of light to control their motions, which may open a door for site directed-cargo delivery in microorganisms under customized controlled light as a microrobot, and this novel algal guiding system could also be used in biomedical applications in the future.

East Chapel Hill HS

Location:	United States	**Track:**	High School
Region:	North America	**Presentation:**	Sunday - Room 302 - 11:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 37

Improving the Characterization of a Riboswitch Based Sensor Using a Liquid Media Assay

Fluoride, in appropriate quantities, is recognized as beneficial for protecting tooth enamel from decay. However, a significant problem arises when excess amounts of fluoride are present in drinking water. Consumption of water containing high amounts of fluoride can contribute to dental fluorosis, which manifests in children as hypomineralization of the enamel. The previous East Chapel Hill iGEM teams had attempted to develop a fluoride biosensor using previously characterized fluoride riboswitches. This system, known as the chloramphenicol acetyltransferase operon (CHOP), allows for the transcription of the antibiotic chloramphenicol acetyltransferase in high amounts of fluoride. Thus, when high amounts of fluoride are present, bacterial growth can be observed in the presence of chloramphenicol. In previous years, we encountered issues forming reliable conclusions from our results when using plating assays. This year, we aimed to develop a more throughput liquid media assay which has allowed for quantitative and more accurate characterization of CHOP.

ECUST China

Location:	China	**Track:**	Manufacturing
Region:	Asia	**Presentation:**	Saturday - Room 313 - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 183

Paper Transformer

Wastepaper, as a recyclable materials, can be regenerated repeatedly in wastepaper factories. Nevertheless, the pulp fibers will shorten with every recycling processes. When it reaches a certain extent, these pulp fibers will be too hard to be reused. Furthermore, in the current recovery process, the paper quality will degrade if those short fibers are not strictly removed.However, this problem can be resolved. We have developed the Paper Transformer that can manufacture composite materials which can improve the properties of recycled paper when mixed into pulp, by achieving the former decomposition of short pulp fibers and the latter in situ synthesis of bacterial cellulose.Also we will not stop at this, as the excellent performance of our Paper Transformer is far from been restricted within the paper-making industry alone but many industries where electronic paper, artificial skin and many other products are produced.

Edinburgh OG

Location:	United Kingdom	**Track**:	Environment
Region:	Europe	**Presentation**:	Friday - Room 311 - 5:30 PM
Section:	Overgrad	**Poster**:	Zone 2 - 140

RemEDye: towards a sustainable textile industry

Dye pollution in water is a major threat to public health and has profound negative effects on the environment. A recent study found that up to 70% of waterways are polluted in major textile producing regions as a result of textile dyeing.Azo-dyes are the most common synthetic dyes and are widely used in the textile, leather and printing industries. Some azo-dyes and their derivatives have toxic and mutagenic effects. We are tackling this problem by (I) improving the enzymatic function of azo-dye degrading enzymes, (II) immobilizing the enzymes as a delivery system, (III) developing biosensors to test contaminants in waste effluents, and (IV) the use of azo-dyes derivatives as a carbon source to produce synthetic spider silk. The main aim of this project is to reduce the environmental impact of azo-dye pollution and to explore novel technologies to promote a sustainable textile industry using circular economy principles.

Edinburgh UG

Location:	United Kingdom	**Track**:	Energy
Region:	Europe	**Presentation**:	Friday - Room 310 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 29

Enhancing hydrogen production in Rhodobacter sphaeroides for use as an economically viable biofuel

The energy supply sector is the largest contributor to CO2 emissions. With the UK's target of net zero emissions by 2050, this industry will have to reduce it's dependance on natural gas. Hydrogen is an alternative, however current methods of renewable production render it economically unfeasible. We've sought to make hydrogen a green yet cost effective solution. We've created a novel biological chassis that exploits both fermentative and photosynthetic pathways for biohydrogen gas production. By genetically engineering hydrogenases from Chlamydomonas reinhardtii and Pyrococcus furiosus into Rhodobacter spheroids, in order to direct more reducing power towards hydrogen synthesis. Our idea to improve photo-fermentative pathways came after researching drawbacks of co-culture experiments. We have also designed 'Hydrolytes', devices to allow our bacteria to grow and collect the hydrogen produced. While also running of waste resources, our project has specifically centered on off-the-grid coal-dependant locations worst effected by Fuel Poverty in Scotland.

EPFL

Location:	Switzerland	**Track:**	Environment
Region:	Europe	**Presentation:**	Sunday - Room 304 - 11:30 AM
Section:	Overgrad	**Poster:**	Zone 1 - 44

ViTest - A rapid field-based diagnostic tool to detect grapevine diseases

Our goal is to create a fast point-of-care nucleic acid test to differentiate between two grapevine diseases : Flavescence Dorée and Bois Noir. Flavescence Dorée is infectious and needs to be quarantined quickly while Bois Noir is not.We start by extracting DNA from infected plant material using a microneedle patch. We then amplify the sequences corresponding to grapevine (endogenous control) and the diseases (if they are present). This step is performed using Recombinase Polymerase Amplification, an isothermal nucleic acid amplification method. The created amplicons are transcribed into mRNA and bind to a toehold sensor, thus activating a reporter gene. Once this gene is translated, it produces catechol 2,3 dioxygenase which reacts with catechol and creates a colorimetric feedback.Both the transcription of the amplicons and the translation of the reporter gene are done in our homemade OnePot PURE cell-free system, which is freeze-dried on a paper strip.

ETH Zurich

Location:	Switzerland	**Track:**	Therapeutics
Region:	Europe	**Presentation:**	Saturday - Room 310 - 10:00 AM
Section:	Overgrad	**Poster:**	Zone 2 - 151

T007 - Licence to Lyse

Antibiotic resistant pathogens are a major threat to global health. Emerging superbugs are rapidly becoming resistant to available antibiotics, while the discovery of new antibiotics is falling behind. Phage therapy offers a potential solution that has achieved remarkable successes. However, it is limited by the number of pathogens that can be targeted by available natural phages.To address this limitation, we aim to increase the range of phage specificities. Host specificity is influenced by the affinity of the phage's binding protein to the bacterial surface. We developed a system that integrates random codons in phage genomes at any locus of interest. This allows for the formation of phage libraries with novel binding proteins that alter the host spectrum. Our bioreactor selects and evolves the best variants. The observed phage-host interactions can be used to further improve library design. Our system could be the basis for personalized treatment of bacterial infections.

Evry Paris-Saclay

Location:	France	**Track**:	Manufacturing
Region:	Europe	**Presentation**:	Friday - Room Ballroom A - 9:30 AM
Section:	Overgrad	**Poster**:	Zone 2 - 209

FAT and FABULOUS

Fat is not so bad. In fact, it can be fab! Fatty acids were primordial constituents of the earliest cell and continue to play key roles in all cellular life today. It is not surprising then that fatty acids, particularly unsaturated ones (think 'omega'), are widely used in the pharmaceutical, agrifood and cosmetic industries. However, their large-scale production is giving rise to many environmental challenges, especially as our planet faces the threat of climate change. Our team is interested in the production of medically-relevant Conjugated Linolenic Acids (CLnAs), which is a class of rare fatty acids with three conjugated bonds. In this project, we develop a launchpad for their bioproduction using the oleaginous yeast Yarrowia lipolytica, a powerful chassis organism, whose metabolism is naturally poised for lipid production.

Exeter

Location:	United Kingdom	**Track**:	Environment
Region:	Europe	**Presentation**:	Saturday - Room 312 - 10:00 AM
Section:	Overgrad	**Poster**:	Zone 1 - 95

PETexe: protecting the oceans one wash a time.

Polyester fibres are used to make 55% of all clothing, which when washed shed tiny microplastic fibres that make their way into our ocean's ecosystem and inevitably our food chain. The 2019 University of Exeter iGEM team is developing a microplastic filter which captures and degrades PET microplastic fibres released from household washing machines, using bioengineered PETase and MHETase enzymes. The PETexe filter will be either attached externally or housed within washing machines, preventing the fibres from entering our water systems and oceans. The fibres will be broken down by these enzymes and release two environmentally benign byproducts terephthalic acid (TPA) and ethelyne glycol (EG). The final filtration system will include an enzyme delivery mechanism to release a concentrated enzyme solution onto the microplastic fibres to break them down before washing the byproducts away prior to the next washing cycle.

FAFU-CHINA

Location:	China	**Track**:	Energy
Region:	Asia	**Presentation**:	Friday - Room 310 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 192

Fossil Fuel -1s -1s, BioDiesel +1s +1s

We use Chlamydomonas reinhardtii as the chassis organism and build a general platform in it to produce biodiesel. Our system can produce cheaper biodiesel.We search for several enzymes and transcription factors in the metabolic pathway of algae, which can increase the oil content and biomass. We construct the corresponding vectors and use electroporation technology to improve the expression of the corresponding genes and TF.We build a light-controlled system to promote the expression of downstream self-flocculating genes when algae receives a specific wavelength of light. With this system, we can collect microalgae at aspecific growth period.In addition, we determined the concentration of domestic sewage suitable for engineering microalgae culture through sampling investigation and simulation experiment, and cultivated our algae in it. This can increase the biomass of microalgae and reduce the content of nitrogen and phosphorus in sewage, which further reducing the cost of sewage treatment.

FAU Erlangen

Location:	Germany	**Track**:	Foundational Advance
Region:	Europe	**Presentation**:	Saturday - Room Ballroom A - 10:00 AM
Section:	Overgrad	**Poster**:	Zone 2 - 141

B.A.A.C.C. - Bispecific Antibody Against Colorectal Cancer

Whilst monoclonal antibodies were the first breakthrough in immunotherapy a few years ago, now bispecific antibodies are at the forefront of research. Our iGEM Team at FAU Erlangen chose to explore the parts and components of bispecific antibodies in a comprehensive manner. Our wet-lab team is testing three different designs inspired by the Bispecific T-cell Engager (BiTE), which differ in their linker. Bispecific antibodies, such as the BiTE are a promising approach to hurdles otherwise faced in current treatment methods, as BiTEs enable immune-cells to target colorectal cancer cells (Graber K. 2014). We envision a modular and simulation-aided (MD-simulations) approach to engineering such bispecific antibodies, thus allowing a higher adaptability to different treatments . We hope that one day the modularity of BiTEs will be a new standard and we want to make our contribution to creating these foundations.

FDR-HB Peru

Location:	Peru	**Track**:	High School
Region:	Latin America	**Presentation**:	Sunday - Room 311 - 11:00 AM
Section:	High School	**Poster**:	HS Zone 2 - HS 46

Fishing for CD: Making a bioassay to be used by Peruvian fishermen on site

The largest exporter of fish-meal and oil in the world, TASA, is concerned about cadmium in their product. Currently, they employ a multi-day test for cadmium and other pollutants, which directs dilution of their product before shipping worldwide. Our project's goal is to detect cadmium using E.Coli transformed with a sensor gene that turns red in the presence of cadmium. These transformed cells will be implemented into a bio-assay designed to be used by anchovy fishermen on their boats to determine cadmium levels in the fish. This test will allow early detection, saving both time and money in the production line because they will be able to infer cadmium levels in the fish-meal before it is bagged. Thus, TASA will be able to make the dilution process before bagging, a much faster and cheaper process than the current method of tearing open bags and making dilutions post packaging.

Florida

Location:	United States	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Sunday - Room 302 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 3 - 266

SCRIBE system coupled with CRISPR/cas9 detects mutations in E. coli

Utilizing bacterial cells for their capacity to serve as computational or memory-like devices has potential applications in fields such as healthcare and biotechnology. Synthetic Cellular Recorders Integrating Biological Events (SCRIBE) uses a reverse transcriptase enzyme to produce single stranded DNA which can be incorporated into the host-genome during DNA replication using the Lambda-Red system which results in a mutation within the bacterial chromosome. This SCRIBE system can be applied to a large population of cells in order to measure the amount of a stimulus by sequencing DNA to quantify the number of times the mutations occur in relation to the entire population. The UF iGEM team seeks to couple the SCRIBE system with the DNA nuclease activity of the Cas9 protein to cut and kill the chromosome of the bacteria with wild type DNA, thereby killing the cells without mutations.

Freiburg

Location:	Germany	**Track**:	Foundational Advance
Region:	Europe	**Presentation**:	Sunday - Room 311 - 4:30 PM
Section:	Overgrad	**Poster**:	Zone 2 - 187

Reflect

Engineering proteins to enhance their activity or make them acquire new desired properties is a major goal of synthetic biology. Most approaches limit themselves to the 20 canonical L-amino acids. However, their stereochemical counterparts, D-amino acids, harbor an immense potential. When assembled into peptides these cannot be recognized by the cellular machineries, thus evading proteolytic breakdown and immunological recognition. This makes them perfect candidates for therapeutics. By establishing a multitude of tools we empower D-amino acids for synthetic biology. We demonstrate the potency of mirror-image phage display by identifying D-ligands towards a toxin of the multiresistant Staphylococcus aureus. We create finDr, a software to perform this method in silico for any target enabling fast, cost-effective prediction of D-ligands. Alongside chemical synthesis, we implement methods to synthesize, incorporate and detect D-amino acids in bacteria. Altogether, we lay the foundations for advancing the use of D-amino acids in cells or as therapeutics.

FSU

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Saturday - Room 311 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 152

FLOEMA: Rapid Prototyping of Antimicrobial Peptide Cocktails to Save Florida's Citrus

Citrus greening is an infectious disease of citrus trees caused by Candidatus Liberibacter asiaticus. The bacteria is found in the phloem of infected trees.The Asian citrus psyllid, a small insect, carries the bacteria in its salivary glands from infected trees to other trees.Citrus Greening causes premature fruit drop and shortens the lifespan of trees which has lowered the production of citrus fruits in Florida by 30 to 80% in the last 20 years.Our solution to Citrus Greening is to inject infected trees with a combination of three antimicrobial peptides.We designed genetic devices that can express antimicrobial peptides in New England Biolabs' PURExpress in vitro protein synthesis kit.We combined the synthesized peptides and demonstrated the inhibition of growth of E. coli and L. crescens which are model organisms for the target species.FLOEMA is a rapid prototyping platform in the epic race to save Florida's citrus.

Fudan

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Sunday - Room 313 - 9:30 AM
Section:	Undergrad	**Poster:**	Zone 1 - 109

ALTER

This year, our team intend to remold E.coli Nissle1917, a kind of commonly used probiotic, to provide a universal platform for intestinal metabolic disease treatment. We introduced 3 important features to improve curative effect in vivo: high competitiveness against intestinal symbiotic as well as harmful bacteria, strong stress resistance against gastric environment, and the ability to control its own flora scale. In our project, we apply our system to solve lactose intolerance, a common disease that affects living quality of 80% Chinese, according to the National Measurement Institute. We show that our platform provides a novel, long lasting solution to this disease. By applying our platform, Nissle1917 can colonize in human gut for longer period of time, while in the meantime express higher level of lactase. This means that the rate of taking bacteria preparations will largely reduce, thus creating a more patient-friendly therapeutic approach to lactose intolerance.

Fudan-TSI

Location:	China	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Saturday - Room 309 - 9:30 AM
Section:	Undergrad	**Poster:**	Zone 1 - 20

R-Evolution: an in vivo sequence-specific toolbox for continuous mutagenesis

Mutation library generation is critical for biological and medical research, but current methods cannot mutate a specific sequence continuously without manual intervention. We hereby present a toolbox for in vivo continuous mutation library construction. First, the target DNA is transcribed into RNA. Next, our reverse transcriptase (RT) reverts RNA into cDNA, during which the target is randomly mutated by our RT's enhanced error-prone ability. Finally, the mutated version replaces the original sequence through recombination. These steps will be carried out iteratively, generating a random mutation library of the target with high efficiency as mutations accumulate along with bacterial growth. Our toolbox is orthogonal and provides a wide range of applications among various species. R-Evolution could mutate coding sequences and regulatory sequences, which enables the evolution of individual proteins or multiple targets at a time, promotes high-throughput research, and serves as a foundational advance to synthetic biology.

Gaston Day School

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Sunday - Room 210 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 122

Water, Water Everywhere

North Carolina depends on a combination of coal and nuclear power plants for energy production. In recent years, multiple coal ash spills have resulted in the contamination of water with heavy metals. Thermal pollution is a constant issue with both coal and nuclear power generation. Our goal is to improve the quality of North Carolina waterways through increasing awareness of pollution in real-time, protecting humans and aquatic life from toxic heavy metals and rising water temperatures. We will create a solar-powered floating device that will send a signal when it detects a water pollutant. We will use a temperature-sensitive green fluorescent protein to detect changes in water temperature. Cadmium, arsenic, and lead will be detected using metal-sensitive promoters combined with red, blue, or green pigments. When a change in color or fluorescent intensity is detected, the device will send a signal to an app, alerting riverkeepers and local residents.

GDSYZX

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Friday - Room 309 - 3:00 PM
Section:	High School	**Poster**:	HS Zone 2 - HS 50

Adorabal(Salidroside produced inArabidopsis thaliana)

The rhizomes and roots of Rhodiola rosea have been used for centuries for medicinal purposes. Recent interest in the species Rhodiola rosea in the West arose from the use of the rhizome as an adaptogen for the treatment of stress, but in the last few years, chemical and pharmacological studies have confirmed other valuable medicinal properties.Approaches on biosynthesis of salidroside in Rhodiola rosea and its key metabolic enzymes have been published, and the required precursor substance exist in Nicotiana benthamiana have been found. Arabidopsis thaliana has the potential of synthetizing salidroside which worth researching.Hence, we were inspired to combine the key metabolic enzymes and these two plants, which are further more competent in commercial production.Our project aims to use the techniques of synthetic biology to provide a sustainable way to obtain large quantities of salidroside in arabidopsis protoplasts.

GENAS China

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 304 - 9:00 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 19

Recombinase Based Biological Relay

Generally, the relay, the key component of electrical automatic control system, receives the output signal of a control module and thus shifts the ON/OFF state of a separated working module. Based on the integrase-attB/attP system and unidirectional terminator, we constructed a set of orthogonal biological relay devices, whose response intervals were characterized by accurate quantifying method so that they can be predictably adapted to different genetic circuits. We designed and constructed a resolution extensible analog-digital converter (ADC), which converts the consecutive analog quantities (the strength of an inducible promoter) into discrete digital signals (indicated by different chromoproteins), allowing the digitized processing and storage of signals. Beyond the common use of recombinase system as simple response to two input levels, our project achieves modifying and utilizing the response interval of this system. The application of relay in genetic circuit can contribute to the improvement of the modularity of artificial biological system.

Georgia State

Location:	United States	**Track:**	Environment
Region:	North America	**Presentation:**	Sunday - Room 306 - 5:30 PM
Section:	Undergrad	**Poster:**	Zone 1 - 5

Synbio-dinium: A synthetic biology solution to coral bleaching

Coral bleaching, the loss of algal symbionts necessary for reef survival, is a disastrous global environmental issue. Though no single factor has been established as the cause, a solution may involve genetically modifying the symbiotic microalgae, Symbiodinium. We are optimizing culturing techniques for Symbiodinium microadriaticum and Oxyrrhis marina (model organism). We designed a codon-optimized red fluorescent protein part that was cloned into a dinoflagellate-optimized expression plasmid (DinoIII)(Sprecher, et. al 2019) for transformation into O. marina as a proof of concept. In parallel, we are attempting to replicate the only known successful transformation of Symbiodinium using Agrobacterium tumefacien carrying a binary vector, pCB302-GFP-MBD (Ortiz-Matamoros et. al 2015), and developing electroporation protocols. A genomic analysis of clade D, a clade associated with higher bleaching resistance but diminished coral growth, will identify target resistance-related genes for transformation into a favorable clade. Corals will uptake the modified algae, increasing their resistance to bleaching.

GIFU TOKAI

Location:	Japan	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Friday - Room 304 - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 214

iVEPOP -in vitro eternal expression of protein-

We, iGEM GIFU_TOKAI, focus on mRNA and changing its topological form into circular to create a new method for mass-production of protein in cell-free system this year. In the current research of circular RNA (circRNA) for protein production, expressing tandem-repeated protein was generated by circRNA without a stop codon. It shows circRNA has a potential ability that it can skip the rate-limiting process of the central dogma of molecular biology, binding ribosomes to mRNA. However, with conventional circRNA, functional protein cannot be translated because protein aggregation quickly occurs. Therefore, we decided to use translation-coupling system, which is found in operons of bacteria to produce monomer protein from circRNA. With applying it to circRNA, ribosomes repeat translation-coupling phenomenon in circRNA and are expected to express monomer protein. Our final goal is to produce functional proteins such as antibodies more efficiently and cheaper in cell-free system to provide medicaments consistently

GO Paris-Saclay

Location:	France	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Sunday - Room 311 - 5:00 PM
Section:	Overgrad	**Poster:**	Zone 2 - 127

DNA-free POETential

DNA constitutes the book of life with all the instructions for survival and proliferation. What could happen without it? This question is at the heart of our project. The void in DNA-less cells led us to invite philosophers and haikus to illustrate our thoughts.Controlled expression of phage nucleases cloned in Escherichia coli generated cells without DNA. Could these dying bacteria host biosynthetic activities? Cells producing a nuclease along with methotrexate-degrading enzymes broke down this toxic anticancer drug showing that DNA-free cells could be used for bioremediation. In another attempt to repurpose DNA-free cells, we infected them with an RNA phage and could observe its proliferation, suggesting that our DNA-less cells may have transiently resembled cells that once thrived in the ‘RNA world’, i.e. cells where the replicating genetic information was carried by RNA instead of DNA. Our work opens interesting avenues in developing new kinds of DNA-free synthetic organisms.

Greatbay SCIE

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 311 - 12:00 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 28

Underwater Adhesives Toolbox

Waterborne organisms like mussels and barnacles produce proteins which can be engineered into strong, durable underwater adhesives. The mussel foot and the barnacle cement contain several proteins, including MFP1/3/5 and CP19K, which makes them capable of holding onto diverse substrates. These proteins can be combined with CsgA to enhance their adhesive and cohesive function. E. coli and Pichia Pastoris are used as the chassis; Pichia Pastoris can induce higher protein yield and perform PTMs like phosphorylation that makes the proteins more adhesive. Another crucial PTM is the conversion of tyrosine to 3,4-dihydroxyphenylalanine by mTyr-CNK, a tyrosinase with high catalytic efficiency. This modification is performed in vivo and in vitro to determine the optimal condition for the most DOPA content. We believe that our underwater adhesives toolbox will provide a promising space for future synthetic biologists to make advances into, thus unveiling a wide range of applications of these proteins.

GreatBay SZ

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 210 - 9:00 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 39

SPIDroin EngineeRing with chroMoprotein And Natural dyes

Spider silk serves as a new material with superior properties that can be applied in medication, cloth, and aerospace fields. However, spider breeding is not applicable due to spider's fierce behavior. The current approach is to produce recombinant spidroins (silk proteins) from other chassis and spin them into silk. This year, we aim to manufacture recombinant spider silk with E.coli and color the silk for application in cloth industry. We modularized three significant domains of spidroin - the N-terminal, the repetitive region, and the C-terminal - and integrated them into various spidroin to form silk. We then dyed the silk with microbial natural pigments deoxyviolacein and indigo. To obtain better color and a more convenient dying process, we fused the repetitive region to chromoproteins and mixed them with spidroin during spinning. Our team hopes to provide a novel approach for cloth production and explore new possibilities for spider silk applications.

Grenoble-Alpes

Location:	France	**Track**:	Diagnostics
Region:	Europe	**Presentation**:	Saturday - Room 311 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 164

NeuroDrop, another reason to shed a tear?

What can your tears tell about you? Joy, sadness, pain What if they could tell so much more?Tears are often neglected as potential diagnostic fluids. However, in addition to their advantageous accessibility, they are unexpectedly rich and contain lots of biological materials.Due to the close spatial proximity of the lacrimal glands and the cranial nerves, an overview of tear composition captures also the pathophysiological changes in the central nervous system. Thus, even if research in tear fluid biomarkers is at an early stage, tear fluid sampling may become a non-invasive and non-painful technique to diagnose patients with neurodegenerative disorders.NeuroDrop aims to demonstrate that the detection of small amounts of biomarkers is possible in small volumes, like tears for example. This is achievable with an innovative synthetic biosensor, coupled with a smart hardware device, enabling sensitive detection in a few microliters.

Groningen

Location:	Netherlands	**Track**:	New Application
Region:	Europe	**Presentation**:	Saturday - Room 310 - 5:00 PM
Section:	Overgrad	**Poster**:	Zone 1 - 108

QRoningen: Bringing Privacy to Life

Communication of sensitive data is becoming less safe. Common methods such as email often do not provide sufficient protection to prevent interception. By combining our expertise from engineering, computer science, and synthetic biology, we created ‘QRoningen’, a protocol based on a physical QR code with the purpose of secure information sharing. Our homemade bioprinter can print reproducible QR code shapes using an alginate bioink that is infused with a mix of different bacterial strains. In order to protect your data, we have engineered E. coli and the fast-growing organism V. natriegens. Tools from synthetic biology such as inducible promoters and kill switches are employed to reveal the QR code upon incubation in the proper environment. Only knowledge of the correct key, being the conditions of growth, will allow you to scan the QR code and receive the message, while exposure to the wrong cues will render it unreadable.

Guelph

Location:	Canada	**Track**:	Diagnostics
Region:	North America	**Presentation**:	Friday - Room 312 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 139

Developing an Antibiotic Biosensor as a Diagnostic Tool to Measure Tetracycline in Animal Products

Contemporary use of antibiotics in medicine and agriculture has resulted in the sharp increase of drug-resistant bacteria. These resistant bacteria pose risks to human and livestock health, as commonly-used antibiotics become less effective for treating infections. Additionally, if animal products contaminated with antibiotics are consumed by humans, there is a risk that the consumer's intestinal microbiota will be damaged or create their own resistant bacteria.In light of this, antibiotic detection and monitoring in the environment and in animal products are of very current relevance. In our project, we've used synthetic biology to develop a bacterial system that can sense tetracycline and respond to its presence by producing a non-toxic biological pigment. The resulting system produces a visible colour change after induction with water, dairy, or meat samples that contain tetracycline. This project lays the groundwork for the development of affordable and sustainable biosensors that can detect other antibiotics.

Gunma

Location:	Japan	**Track**:	Foundational Advance
Region:	Asia	**Presentation**:	Friday - Room 312 - 4:30 PM
Section:	Undergrad	**Poster**:	Zone 3 - 241

Self-restraining bacteria

The conservation of biological diversity is required worldwide, and one measure to achieve this goal would be to confine living genetically-modified organisms in laboratories or plants to prevent them from outgrowing native organisms in environment. If Escherichia coli (E. coli), is endowed with the character of predetermined limited proliferability, such E. coli strain would be very useful for research and development. Here, we designed a system in which E. coli cells lyse spontaneously when they proliferate above certain densities by taking advantage of the mutual inhibition of T7 lysozyme and T7 RNA polymerase. On the other hand, advanced biotechnology cannot be utilized properly when the public does not understand their risk and benefit. As the Information Technology Literacy has become indispensable to everyone, the promotion of Genetic Literacy is now needed. We discussed the importance of Genetic Literacy with high school students by using up-to-date resources we prepared.

GZHS-United

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room Ballroom A - 4:30 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 61

COLORAL(Color the Coral)

A coral reefs is an underwater ecosystem.Corals owe their beautiful colors in part to symbiotic algae, which live inside the coral cells.Coral reefs are sensitive to the temperature of the water for algae's respond to elevated temperatures which connects with the coral bleaching.We concerned about how exactly the coral bleaching happened and found that the hydrogen peroxide may be the most significant signaling molecule between coral and algae in this intercellular communication .Algae has enzymes to remove hydrogen peroxide.Since the global warming,the concentration of hydrogen peroxide has been up too much that they can't afford.Hence the relationship between-Corals and Algae gradually break up.We foucs on keyenzymewhich takes part in removing hydrogen peroxide in algae, hoping to optimize this enzyme by the help of synthetic biology analysis, so as to help restore the coral-zooxanthellae symbiosis against coral bleaching.

Hamburg

Location:	Germany	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Sunday - Room 309 - 5:00 PM
Section:	Overgrad	**Poster:**	Zone 1 - 4

RIBOT - programming cells with RNA

Engineered genetic circuits have reached high complexity levels. These developments require transformation with more than one plasmid which in turn demands the simultaneous use of different antibiotics. Our aim is to enable transformation with multiple plasmids and just one antibiotic to minimize side-effects. In our study we describe a novel RNA-based approach that allows for selection of several plasmids with only one antibiotic. The strategy is based on toehold switches that easily and reliably introduce a complex AND-logic to our design, thus enabling the selection of bacteria with all required plasmids. Our new method shows clear advantages: it increases cell growth and decreases stress, pushing forward the boundaries of synthetic biology.

Hangzhou WestLake

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room Ballroom A - 5:00 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 2

Engineering synthetic riboswitch for detection of polychlorinated biphenyls

Riboswitches are dynamic RNA molecules that recognize a variety of analytes found in cells such as metabolites or ions. Most riboswitches bind to their corresponding analytes and that invoke a conformational switch that subsequently regulates the expression of the downstream genes. This project explores the design and application of synthetic riboswitch that is capable of detecting environmental contaminants in resource-limited settings. As a proof-of-concept design, we will focus on detecting PCBs, a group of manmade aromatic chemicals that had been widely used in many industrial processes. We will insert a previously discovered PCB aptamer either into the 5'-UTR of a bacterial reporter gene or downstream of the start codon. Aptamer binding to PCB will lead to its structural switching that leads to enhancement or reduction of gene expression. Readouts can be a reporter protein or the migration of bacteria to access the efficiency of the proposed system.

Harvard

Location:	United States	**Track:**	New Application
Region:	North America	**Presentation:**	Saturday - Room 210 - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 1 - 36

FlowGlo: Graded Shear Stress-Sensing in Mammalian Cells

Tissue engineered vascular grafts (TEVGs), used instead of autografts for surgeries such as coronary artery bypass, fail most frequently due to atherosclerosis and thrombus formation. Resulting partial occlusion of a blood vessel increases the shear stress experienced by its walls to levels far beyond the physiological norm. We are developing a system in endothelial cells of three shear mechanosensing proteins with different sensitivities. Activation of each drives expression of distinct fluorescent reporters. We link activation to response by adapting the TANGO assay as well as the Calmodulin/Calcineurin-NFAT pathway. This system could eventually be used to secrete therapeutic agents under pathologically high shear stress, such that engineered cells seeded in TEVGs could respond to and treat local occlusions. We have worked to assemble the genetic constructs that comprise the system, and hope to demonstrate their function within microfluidics and TEVG settings.

HBUT-China

Location:	China	**Track:**	Environment
Region:	Asia	**Presentation:**	Friday - Room 306 - 10:00 AM
Section:	Undergrad	**Poster:**	Zone 1 - 96

Gluttonous Yeast

At present, heavy metal pollution is quite serious, which has great harm to the environment and organisms. HBUT-China iGEM team noted the serious problem and focused on the treatment of nickel, one of the major ions causing heavy metal pollution. The team chose Saccharomyces cerevisiae as chassis, build an engineering strain that can actively absorb nickel ions and store nickel ions in vacuoles. Nickel ions can be first captured onto the surface of yeasts by a surface display system, then will be transferred nickel ions to cells by a channel protein. At last theyare successfully transferred to vacuoles by a translocator, which can strengthen yeast's tolerance to Nickel ions. In addition to the absorption, we also envisage recovering nickel ions, so that the original nickel waste can regain its value. We also made a working model of our processing system, combining with a cell immobilization technology.

HK GTC

Location:	Hong Kong	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 306 - 5:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 12

Plasteriase: Mutating a Bacterial PET-degrading Enzyme

Polyethylene terephthalate, PET, formed by condensation and polymerisation of terephthalic acid (TPA) and ethylene glycol (EG), is one of the most commonly used polyesters in the world. The degradation rate of PET is significantly slow which make them extremely persistent and hard to dispose. Although PETase can biologically degrade PET, the rate of enzymatic reaction is not suitable for usage in plastic waste treatment. Therefore, creating mutants which have a higher PET degradation activity may represent an effective and a long term solution of pollution from PET. After structural studies of PETase and its mutants, we hypothesized a more hydrophobic surface and narrower substrate binding site could lead to an increase in activity due to a better substrate interaction with PET. In our study, four single or double PETase mutants are produced and their PET degrading capacity are measured by enzyme activities for para-nitrophenol (pNP)-aliphatic esters.

HK SKHLPSS

Location:	Hong Kong	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 309 - 9:00 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 65

NANO-TECHtrahedron: Using nano-tetrahedron to check for the probiotic concentration from food sample

In iGEM 2017, our team successfully designed a DNA three dimensional nano-structure to detect the presence and concentration of H3N2 influenza mRNA biomarker.To further prove the ability of the DNA nano-structure, this year we used four DNA strands to form a DNA nano-structure to detect the presence and the concentration of Lactobacillus instead of just a gene fragment of a bacterium. We successfully designed nano- triangular bipyramid applicable to the bacterium using Tiamat. We then successfully detect the presence and concentration of bacteria by measuring its peroxidase activity.

HK SSC

Location:	Hong Kong	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 302 - 3:00 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 3

Expression of dCas9-sgRNA Complex in Microcystis Aeruginosa Resulting in the Repression of its Toxin-producing Gene

Microcystis aeruginosa is one of the most common cyanobacteria responsible for harmful algal blooms. This cyanobacterium produces microcystin, a hepatotoxin that damages the liver. However, direct lysis of Microcystis aeruginosa may not best for the environment as it holds ecological values of heavy metal sorption and oxygen synthesis. We hope to silence the microcystin biosynthesis cluster(mcy) using a catalytically dead Cas9 (dCas9) enzyme lacking endonuclease activity. When the dCas9 enzyme is co-expressed with a guide RNA(sgRNA), the dCas9-sgRNA complex specifically binds to the McyB gene and blocks transcript elongation, leading to the repression of the McyB gene without altering the chromosome of the Microcystis. Here we provide the design of a dCas9-sgRNA expression gene in a shuttle vector that can replicate in both E.coli and cyanobacteria. We will also be conducting downstream analysis to see how our dCas9-sgRNA expression plasmid affects the microcystin-production rate and oxygen synthesis rate of Microcystis.

Hong Kong HKU

Location:	Hong Kong	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Saturday - Room 304 - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 1 - 41

Engineered Salmonella Typhimurium for enhanced drug delivery and cancer stem cell targeting

Our project utilizes DNA nano-drug carrier (NDC), in combination of engineered Salmonella Typhimurium, in the treatment of liver cancer.In vivo synthesis of DNA NDC is achieved using Murine Leukemia and HIV-reverse transcriptase system in E. coli as developed last year. And the design of nanostructure consists of aptamers targeting nucleolin, cancer stem cell marker (EpCam) and also Salmonella surface antigens. It allows high specificity targeting of DNA NDC, also allowing the utilization of Salmonella as a motile vehicle to regions unreachable by diffusion in solid tumour. Salmonella Typhimurium is engineered to increase flagellar production with flhDC transcription factors, to increase tumour accumulation and motility. It is also used to transport vector encoding artificial miRNAs upon cell invasion, to increase drug sensibility of cancer stem cell. A co-culture system consisting of Salmonella and cancer spheroid culture is used to create accurate 3D tumour modelling, replacing the use of animal model.

Hong Kong HKUST

Location:	Hong Kong	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Saturday - Room 311 - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 3 - 232

Combined CRISPRi and Antisense RNA Toggle Switch

A core concept of synthetic biology is controlling gene expression, often achieved through inducers and protein repressors to create feedback loops and switches. Our team has combined the CRISPRi system with RNA regulators to achieve a toggle switch. The switch utilizes the catalytically inactive form of Cas9 (dCas9) to achieve targeted and reversible repression of genes via specific single-guide RNAs (sgRNAs). Alternatively, the transcription of antisense RNA (asRNAs) reverses the effect of the dCas9 modulated repression on the desired genes. This method of regulation would allow for the ability to fine-tune and easily customize the execution of highly complex genetic circuits. Using GFP and RFP in our circuit as a proof of concept, RFP is suppressed under the first inducible promoter while GFP is produced. Under the second inducible promoter, the dCas9 is unable to bind to mrfp, derepressing mrfp and suppressing GFP.

Hong Kong JSS

Location:	Hong Kong	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 304 - 3:30 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 6

E. coli as the synthetic absorbent of heavy metal in aquaponics systems

Our project is inspired by the household water pollution incident that occurred in Hong Kong in 2015. Aquaponics is a popular way of farming in Hong Kong due to the limit of space. However, the aquaponic system is highly vulnerable to heavy metal pollution due to the bioaccumulation effect. Therefore, this system was chosen as a model for investigation.We previously demonstrated that E. coli itself could remove about 30% of copper pollutants in water after 4 hours. In this project, we aimed to enhance E. coli copper adsorption ability by ectopically expressing CgMT, a Metallotionien from Corynebacterium glutamicum, and knocking out its endogenous copper exporter genes such as cusA, copA, cutA and cusF.In addition, a filtering device was built to utilize the bacteria in the real-life aquaponic systems. Results indicated that the copper level can be reduced significantly (~40% in 2 days) by our 'bacterial filter device'.

Hong Kong LFC PC

Location:	Hong Kong	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 310 - 5:00 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 60

A Novel Approach for Therapeutic Treatment of Gout using Probiotic E. coli

Hyperuricemia, an elevated level of uric acid due to the high purine diet causes health problems including gout, renal and vascular disorders. Uric acid cannot be removed naturally in human, 7mg/dL in serum would facilitate the formation of crystals in joints causing gout. Traditional injection of pegloticase would catalyze the conversion of uric acid to allantoin associated with inciting immunogenicity side effect. With a deeper understanding of degradation on uric acid, 5-hydroxyisourate (HIU) hydrolase and uricase are the enzymes involves in different stages for complete decomposition of uric acid. Our project aims to synthesize uricase and HIU hydrolase using E.coli. Nissle 1917, future application of uricase would be considered as a potential non-invasive therapeutic approach to lower the uric acid in humans. Questionnaires on dietary intake of food and human perception with different stakeholders on the treatment of gout using E.coli will be crucial for the direction of our research.

Hong Kong UCCKE

Location:	Hong Kong	**Track**:	High School
Region:	Asia	**Presentation**:	Saturday - Room 312 - 12:00 PM
Section:	High School	**Poster**:	HS Zone 1 - HS 20

Solving the Hong Kong food waste problem- synthetic biology and robotics integrated approach.

Last year the Hog Kong government announced the construction of facilities to tackle the food waste problem in Hong Kong. However, we noticed that those facilities are only built to solve the industrial food waste problem but not domestic food waste. It left us thinking, is there any way we can solve the problem at home using simple engineering and synthetic biology? We designed composite parts to digest amylase, lipase and produce a more pleasant smell during the process alongside a food waste conversion machine to tackle the modern-day problem in a smaller scale and faster paste.

Hong Kong-CUHK

Location:	Hong Kong	**Track**:	Food and Nutrition
Region:	Asia	**Presentation**:	Sunday - Room 309 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 12

Banana Savior: The X Sense

Banana Xanthomonas wilt (BXW) is caused by the bacteria called Xanthomonas campestris pv. mussacearum (Xcm) and all the bananas are subjected to this particular bacterial infection. The aim of this project is to develop a simple, laboratory-independent detection device that could be used to identify BXW-infected bananas at early stages. It will be beneficial to limit the infection rate and prevent epidemic spreading across the border.Diffusible signal factor (DSF) is a signal in cell-cell communication, which is also used as the biomarkers of bacteria. Our design aims to detect the DSF specific to Xcm to indicate the presence of this pathogen inside the sample to be tested. By synthetic biological approach, we couple the signaling pathway of RpfC/RpfG in Xcm to the signaling pathway of E. coli. Hopefully, a transformed E. coli can recognize the DSF of Xcm and could show a red chromoprotein positive signal for warning.

HUBU-WUHAN

Location:	China	**Track:**	Energy
Region:	Asia	**Presentation:**	Sunday - Room 313 - 11:00 AM
Section:	Undergrad	**Poster:**	Zone 1 - 56

Waste Cartons to Renewable Bioproducts by Zymomonas mobilis

Our project aims to build up biological parts in Zymomonas mobilis for converting waste cartons into Poly-β-hydroxybutyrate (PHB) and biofuels. For Z. mobilis engineering, we express the cellulosome in the Z. mobilis to construct CBP strains that can directly utilize cellulose, because it cannot grow normally in media with celluloseas a single carbon source. In addition, a reporter-gene system established for Z. mobilis is used to effectively characterize biological parts, and Oligo-linker mediated assembly (OLMA) method is applied for the assembly of biological parts. Moreover, through a newly developed CRISPR-cas guided gene editing technology, assembled biological parts are integrated into the genome of Z. mobilis. Finally, in order to create a highly predictable gene expression pattern to generate a high flux of transcription, we need establish a biophysical model to predict the correlation between regulatory parts such as promoter and terminator sequences with their strength on gene expression.

Humboldt Berlin

Location:	Germany	**Track:**	Environment
Region:	Europe	**Presentation:**	Sunday - Room 312 - 9:00 AM
Section:	Overgrad	**Poster:**	Zone 2 - 199

Chlamylicious - Establishing Chlamy at iGEM while degrading plastic

Chlamydomonas reinhardtii is a unicellular algae with promising prospects for synthetic biology. Its ability to grow photoautotrophically makes it an ideal chassis to tackle a variety of problems in an environmentally friendly way. Our goal is to adress the worldwide problem of plastic pollution by creating a catalogue of genetic parts for C. reinhardtii that can enable the algae to degrade PET plastic. By combining different functional genetic parts we plan to address the problem from multiple perspectives. To do so, we are designing and building a reproducible low-budget cultivation setup which will aid us and others in the process of collecting data of algal growth under the influence of transgenic constructs and other parameters. Our overall goal is to try and show the possibility for using C. reinhardtii as a versatile tool for dealing with a complex problem such as plastic pollution from different perspectives.

HUST-China

Location:	China	**Track**:	Manufacturing
Region:	Asia	**Presentation**:	Saturday - Room 311 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 208

BanaMax -- an Optimized Degumming Kit for Banana Fiber

410 million people on the earth choose banana as their main food. 8800 million tons of banana straw, which is directly discarded back to fields every year, contains abundant fiber and other resources for industry to increase income and to reduce banana disease. Chemical banana degumming technology remains the problems of high pollution and cost. HUST-China designed Banamax, an engineering Pichia pastoris that responds to environmental pH and adaptively regulates the amount of biodegrading enzymes. The construction of high-enzyme activity kits were completed by combining 3 pH-responsive promoters with 6 different signal peptides and 3 biological degumming enzymes. We successfully degraded pectin at pH 7 and degraded lignin at pH 5. Alkali was expressed at pH 2 to buffer the environmental pH and maintain the enzyme activity. Crude fiber has been successfully obtained from banana straw sample in trial, which shows the feasibility of the entire biological intelligent manufacturing system.

HZAU-China

Location:	China	**Track**:	New Application
Region:	Asia	**Presentation**:	Sunday - Room 311 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 43

Smell Once More - A Mobile Smell Recorder & Player

Can your mobile phone record and reproduce smells? At present, we can use mobile phones to record and replay videos and audios. But smells can't be recorded nor reproduced. In our project this year, we aim to design and build a machine composed of an E. coli assay. It can sense smell and store it by converting the smell signal to the accumulation of a small RNA, taRNA, which is accumulated via the positive feedback of the quorum-sensing system. When we want to smell once more, we just need to give another signal to the machine. Along with the accumulated taRNA, the signal will trigger the reproduction of the smell that the E. coli has sensed. The assay can record and reproduce a composite smell. In this way, we can always keep and reproduce the smell we want to remember.

HZNFHS Hangzhou

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room Ballroom A - 11:00 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 34

Biological dinitrogen fixation Nif-specific transcriptional activator NifA gene modulates pH and bacteria around tea plants

Biological dinitrogen (N2) fixation is a natural process of significant importance in world agriculture. The symbiotic plasmid encodes all of the known nodulation (besides NolR) and nitrogen fixation proteins, such as the very important gene nif-specific transcriptional activator (NifA). We cloned the NifA gene from Sinorhizobium fredii, constructed the over-expression vector of pHT43 and transformed into Bacillus subtilis. The NifA over-expressed Bacillus subtilis modulated the soil pH from 4.0 to over 7. It could also provide Nitrogen and improve cotton plant growth. Further research shows that it could maintain the pH about 7 in soil around tea plants and provide Nitrogen for them.

iBowu-China

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 309 - 11:00 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 54

Biocontrol of Soft Rot

Potatoes are the fourth largest crops in the world. Soft rot is one of the main plant diseases for the decrease of potato production. Pectobacterium carotovorum (Erwinia carotovorum) is a main plant pathogen causing soft rot of potatoes as well as many other crops. We plan to develop an easily-used toolkit based on cell-free system which can detect and prevent the occurrence of soft rot. Two kinds of gene circuits are designed for the detection and prevention. One is to detect AHL (quorum sensing signal molecular) of P. carotovorum; the other is to express the hydrolase AiiA and the antibacterial peptides which could degrade AHL and generally kill bacteria separately. The gene circuits coupling with cell-free expression system are lyophilized on paper and can be used with rehydration.

IISc-Bangalore

Location:	India	**Track**:	New Application
Region:	Asia	**Presentation**:	Friday - Room 306 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 3 - 243

SYNSHINE : Dynamic Optogenetic Regulation of Co-culture

Co-culture has numerous applications in biology for studying natural or synthetic interactions between cell populations. In artificial or laboratory settings it is difficult to ensure the co-culture of species due to variety of factors : growth rate being the primary reason which results in one species out-competing the another. Our project aims to dynamically control the co-culture of E.coli and B. subtilisby using optogenetics. Optogenetics provides precise spatio-temporal resolution which overcomes the limitations of existing co-culture techniques(i.e. : Quorum Sensing, Auxotrophic cross-feeding etc.) .The hardware component of our project measures the ratio ofpopulation at regular intervals and utilizes lasers to regulate the growth of the species.

IISER Bhopal

Location:	India	**Track**:	New Application
Region:	Asia	**Presentation**:	Sunday - Room 309 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 25

E.L.S.A. - E.coli Learning SuboptimalAcclimatization

Low intrinsic stability has marred the production of psychrophilic proteins in commonly used mesophilic systems. This may lead to a lopsided bias towards the expression of the few psychrophilic proteins which can manage a stable structure at those temperatures.Of the two possible approaches to help counterpoise the expression in favor of most psychrophilic proteins, the approach we have taken is to develop a ‘new’ psychrophilic host. Rather than characterizing novel strains, we plan on converting a highly characterized system in synthetic biology, E.coli, by introducing genes that confer cold-tolerance to it thereby reducing dependency on regular mesophilic hosts and possibly making it the model system for cold temperature-based systems.

IISER Kolkata

Location:	India	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Friday - Room 309 - 4:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 124

unLeish: Designing a nitric oxide sensing bacteria to detect and eliminate Leishmania parasite inside macrophages

Leishmaniasis comes under the category of Neglected Tropical Disease affecting millions of lives across the globe with a hotspot in India and Africa.The current treatment is expensive and comes with serious side effects. We the team iGEM of IISER Kolkata present unLeish, a genetically modified bacterium with a Nitric Oxide sensor that specifically targets the Leishmania-infected macrophages.The sensor is activated only when intracellular NO level falls within a certain concentration range, which is unique to Leishmania-infected macrophages and ensures that our targeted response is specific to these cells only. Further, the sensor activates the expression of a bacterial iron chelator Aerobactin (to reduce iron available for Leishmania) and subsequently stop Leishmanial growth and replication within the macrophage.

IISER Tirupati

Location:	India	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Saturday - Room 312 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 38

A Potential Probiotic for Targeted Immunotherapy against Colon Cancer

The therapeutic landscape of oncology is fast changing. However, existing interventions are often limited by their cost, side-effects and efficiency. Our project aims to engineer a bacteria which can be used to treat colon cancer. Using Escherichia coli as our chassis, we will be expressing a colon cancer homing peptide on the bacterium's fimbriae which should aid it to attach specifically to colon cancer cells. As a fail-safe mechanism to reduce non-specific effects, we harness the abnormally high lactate levels in the tumour micro-environment as a second layer of confirmation to stimulate the bacteria to produce the immunomodulator Interleukin-12 (IL-12). We are making our bacteria lactate sensitive by tweaking the lactate metabolizing lldPRD operon.The secreted IL-12 inside the colon should trigger a signalling cascade which recruits immune effector cells to the tumour micro-environment - leading to tumour suppression.

IISER-Pune-India

Location:	India	**Track**:	Foundational Advance
Region:	Asia	**Presentation**:	Saturday - Room 309 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 79

Mutatis Mutandis: Evolving LEADing solutions for an enLIGHTened change

Directed evolution, a recent hot topic, is a powerful tool in the field of bioengineering. The current methods for performing directed evolution come with certain limitations, such as instability of hypermutator strains, toxicity of chemical mutagens and inability to evolve gene networks with error prone PCR. Our project aims to overcome these problems by developing a self-regulated system which can achieve tunable mutation rates in E.coli.To demonstrate the working of the system and to address a pressing local issue of lead pollution in water bodies, we aim to develop a lead biosensor and evolve a lead bioremediating strain for higher efficiency using our tool.

IIT Chicago

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Saturday - Room 309 - 5:30 PM
Section:	Overgrad	**Poster**:	Zone 1 - 21

Green Ocean

Green Ocean's aim is to genetically modify marine cyanobacteria that will enable it to degrade polyethylene terephthalate (PET), most common form of plastic in the oceans. The engineered cyanobacteria harbor PETase, an enzyme that breaks down PET. Our approach is novel because instead of using the traditional e. coli, which may not survive in the ocean environment, cyanobacteria are photosynthetic bacteria that thrive in the ocean.We have modified the prototypical Ideonella sakaiensisPETase gene to be compatible with expression and secretion in cyanobacteria. This engineering was accomplished in a dual-host plasmid shuttle vector in E coli, and then transferred to a model cyanobacterium Synechococcus elongatus by conjugation.We also developed a PET degradation assay system consisting of fluorescent PET nanoparticles. The degradation of the PET nanoparticles was measured by a variety of imaging and functional assays.We desire to make a change in the world starting with a Green Ocean.

IIT-Madras

Location:	India	**Track**:	Manufacturing
Region:	Asia	**Presentation**:	Friday - Room 312 - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 75

Phyte Club

Camptothecin is a topoisomerase inhibitor and a potent anti-cancer drug used to treat colon cancer, ovarian cancer, and small cell lung cancer amongst others. India's primary source of camptothecin is Nothapodytes nimmoniana, a plant endemic to the Western Ghats. N. nimmoniana is now endangered due to overharvesting for medicinal purposes. The fungal endophyte fungal endophyte Fusarium solani can be synthetically modified to produce camptothecin as the camptothecin biosynthesis pathway has been elucidated and F. solani has most components of the pathway except for one - the enzyme strictosidine synthase (STR). This approach of engineering the fungal endophyte with the enzyme STR will reduce the harm caused to native biodiversity.

Ionis Paris

Location:	France	**Track**:	Environment
Region:	Europe	**Presentation**:	Friday - Room 311 - 4:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 59

Cinergy Project: Degrading cigarette butt filters to produce electricity and limit their environmental impact

Cigarette butts represent a major danger for our environment, with one cigarette butt polluting up to 500 liter of water. Thus, our project Cinergy aims to add value to cigarette butt filters, made of cellulose acetate (CA), by producing electricity. The microbial fuel cell used will include genetically modified bacteria, Escherichia coli and Shewanella oneidensis, and be linked to a battery device. This system will contain two E. coli populations: the first one degrading the CA into substrate molecules to produce lactate and the second one producing flavins. These will be used by Shewanella oneidensis to produce a more efficient electrical current.Modified bacteria were produced by transformation process and/or gene knock-out. Cellulose acetate degradation ability was quantified and compared to the original bacteria, Neisseria sicca. Electrical current was successfully produced and measured. Finally, a functional prototype was built and tested.

ITB Indonesia

Location:	Indonesia	**Track**:	Environment
Region:	Asia	**Presentation**:	Friday - Room 313 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 3 - 227

shrimpal.id: Early Detection Tool for White Feces Disease in White Shrimp Ponds

Vibrio parahaemolyticus, an emerging pathogen of white shrimp that cause White Feces Disease (WFD), still poses major threat in white shrimp industry. Unfortunately, Vibrio parahaemolyticus is hard to detect; shrimp farmers tries to estimate its existence through physicochemical and traditional parameterswhich does not always give accurate prediction. We design Escherichia coli that could detect Vibrio parahaemolyticus in shrimp pond water and estimates its quantity. We try to express the signaling proteins of Vibrio parahaemolyticus in Escherichia coli: LuxN, LuxO, and LuxU and integrate them with dCas9 system that regulates GFP expression. It is expected that when the Vibrio parahaemolyticus level is high, it would produce enough autoinducer molecules to be detected by LuxN and induces the cascade of the system until GFP is expressed. This system would allow shrimp farmers to detect Vibrio parahaemolyticus in their ponds earlier and easier, hence they could do preventive measures to stop WFD.

ITESO Guadalajara

Location:	Mexico	**Track**:	Environment
Region:	Latin America	**Presentation**:	Saturday - Room 304 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 147

RubisCO

In RubisCO, we are thinking of new ways in which we can manage the waste we put in the environment through the gas and wastewater streams that come from the city and the industry, by harnessing the capability of cyanobacteria to grow in brackish water and to fix carbon dioxide through its metabolism. But this process has become slow and prone to errors, losing part of its output through photorespiration. From this understanding, we are focusing on enhancing the carbon fixing mechanisms of Synechococcus sp. and conducting the surplus of carbon flow to the synthesis of high added-value chemical intermediates, such as free fatty acids, to increase the economic feasibility of the implementation ofCarbon Capture and Utilization technologies, which are urgently needed to fight back Climate Change. Systems Biology, Bioprocess' Simulation, and integral stakeholder management have been performed to assess the feasibility and impact of the proposal here presented.

Jiangnan-China

Location:	China	**Track:**	Manufacturing
Region:	Asia	**Presentation:**	Friday - Room Ballroom A - 10:00 AM
Section:	Undergrad	**Poster:**	Zone 2 - 203

SUPERB

We have found one of the strongest surfactants, which is called surfactin, and its great value in oil displacement. In order to produce surfactin industrially, we modified Bacillus subtilis 168 by knocking out competition pathways, replacing promoters and enhancing resistance efflux genes.

JiangnanU China

Location:	China	**Track:**	New Application
Region:	Asia	**Presentation:**	Saturday - Room 304 - 2:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 142

Terminator of E. coli Phage

Escherichia coli is one of the most commonly used bacteria in biological laboratories and microbial fermentation industry. However, in practical application, phage infection is often encountered, which affects the process of biological experiments and causes huge economic losses.Therefore, we aim to construct a phage-resistant strain of Escherichia coli by combining two biological component circuits. In Escherichia coli BL21, we achieve absolute resistance to specific phages through phage inducible promoter PA and PB, as well as resistant protein components antP and toxic protein components kilP. At the same time, we used fluorescent protein genes gfp and mCherry to alarm phage infection at different periods and monitor the status of phage infection strains in real-time.With our genetic circuitry, E. coli has a longer-term application in laboratory experiments and fermentation production, and can produce stably without interference from phage in the fermentation production of γ-aminobutyric acid, β-aminobutyric acid, 2,5-dimethylpyrazine, etc.

Jiangsu High School

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 311 - 9:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 14

Discovery of autophagy agonist against Alzheimer's disease

Alzheimer's disease (AD) is a progressively neurodegenerative disease, with typical hallmarks of amyloid β (Aβ) plaque accumulation, neurofibrillary tangle (NFT) formation and neuronal death extension. There are only five FDA-approved drugs for the relief or treatment of AD, including tacrine, donepezil, rivastigmine, galantamine, and memantine, despite their varied side effects in clinical use, which cannot substantially block the progress of the disease. Therefore, it is important to develop effective new anti-AD drugs. Autophagy is a physiological process for cells to remove macromolecules, cell subunits and aggregates that affect normal cell functions. It has been believed to be a promising target for anti-AD drug discovery. Here, we use mWasabi-tagRFP fluorescence-tagged LC3 (mWasabi-tagRFP-LC3) to monitor the autophagic flux in SH-SY5Y cells. We find a compound effectively increased both yellow and red puncta in SH-SY5Y cells compared with the control cells, indicating that it may stimulate autophagic flux.

Jilin China

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Friday - Room 304 - 10:00 AM
Section:	Undergrad	**Poster:**	Zone 2 - 177

Guardian of rose: New Therapy for Vulvovaginal Candidiasis

Vulvovaginal candidiasis is an infection primarily caused by Candida albicans that affects millions of women.Patients usually responds rapidly to antifungal azole therapy.However, continuous emergence of relapses and drug-resistant cases is reported.Developing effective approach to improve therapeutic efficacy and reduce drug resistance is urgently needed.In our project, a non-antibiotic and novel strategy with the function of sensing, inhibition and killing C. albicans is generated to improve the therapeutic effectiveness. Sensing system is capable of detecting the signal molecule secreted by C. albicans and initiating the downstream genes.Once triggered, the four individual downstream genes come into therapeutic effect: inhibition of the hypha phase by BDSF, degradation of the hyphae through Msp1, degradation of the biofilm by β-1,3-glucanase, and killing C. albicans with the antibacterial peptide LL37.In addition, the suicide system is added for safety reasons□which could trigger suicide in the absence of C. albicans.

JNFLS

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 310 - 4:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 22

Indoor formaldehyde recycle-producing Xylulose

Formaldehyde is becoming the top one killer in the indoor chemical pollutants, and it has been identified as carcinogenic and teratogenic substances by the World Health Organization (WHO). Human payed more attention on the removal of indoor formaldehyde, but these removed formaldehyde is released to the environment which is a kind of waste of resources.Xylulose as a metabolic intermediate is the precursor of rare sugars, and its unique pattern of biological activity plays an important role in the fields of food, health, medicine and so on.We found a new pathway for xylulose synthesis from formaldehyde. Two important enzymes benzoylformate decarboxylase mutant BFD-M4 (from Pseudomonas putida) and transaldolase mutant TalB-F178Y (from Escherichia coli) are involved in this pathway in which indoor formaldehyde can be eliminated, and xylulose is produced with formaldehyde.

JNU-China

Location:	China	**Track:**	Manufacturing
Region:	Asia	**Presentation:**	Sunday - Room 306 - 9:00 AM
Section:	Undergrad	**Poster:**	Zone 3 - 246

Polyglu: Biosynthesis of □-PGA with tailored D/L ratios

γ-polyglutamic acid (γ-PGA) is an emerging biopolymer being widely used in cosmetics, biomedicine and othe fields. D-glutamate-rich γ-PGA is industrially produced by natural strain Bacillus species. D-glutamate degrades more slowly and L- glutamate has better biocompatibility. Therefore, γ-PGA with tailored L/D glutamate ratio is demanded for more diverse applications. By constructing the biobricks of γ-PGA synthase complex, 0.696 g/L L-glutamate-rich γ-PGA was accumulated in Corynebacterium glutamicum. Using the mathematical models based on the fermentation profile, the fermentation was optimized, and 15 times more γ-PGA was produced than that before. By introducing glutamate racemase gene racE under different Ptac promoter mutants, the L-glutamic acid content in γ-PGA varies from 97.1% to 36.9%. Finally, we devoted to fine tune the D/L-monomer ratio using standarized RBS elements (RBS modified with bicistron design). Our project provides a method for customerized polymer biosynthesis with precisely controlled D/L ratio, and may expand to other biopolymer synthesis.

Johns Hopkins

Location:	United States	**Track**:	Food and Nutrition
Region:	North America	**Presentation**:	--
Section:	Overgrad	**Poster**:	--

Producing Catechins in Non-Pathogenic E.Coli

Catechins, molecules that boost cardiovascular health and prevent cancer, are found naturally in the camellia sinensis plant, which is used to make oolong tea and green tea. However, the concentration of catechins in these consumable products is quite low, and these beverages can have an unpleasant taste to some people. Therefore, we have created a genetically engineered non-pathogenic strain of E. Coli that can produce catechins. These catechinscan be further purified and encapsulated to create a concentrated catechin supplement, which can be taken to boost cardiovascular health and minimize the risk of cancer. In order to create this catechin-producing E. coli, we utilized molecular biology techniques including PCR, gel electrophoresis, plasmid assembly, and high-performance liquid chromatography. We then tested our synthetically produced catechins on cancer cells in order to determine the antioxidant effects of the product.

KAIT JAPAN

Location:	Japan	**Track**:	Environment
Region:	Asia	**Presentation**:	Friday - Room 310 - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 113

Activation of the symbiosis between plants and mycorrhizal fungi

About 80% of land plants have symbiotic relationships with mycorrhizal fungi. This symbiotic relationship not only strengthens plant's resistant to diseases and droughts, but also promotes growth. Therefore, mycorrhizal fungi are expected to be used as agricultural materials. However, in modern agricultures, we only uses chemical fertilizers, which doesn't utilizes the symbiotic relationship between mycorrhizal fungi and plants. Recent studies have shown that mycorrhizal fungi rely on plants for palmitoleic acids and the fatty acid is essential for fungal growth. Therefore, we aimed to construct a bacterium which synthesize palmitoleic acids.

KCL UK

Location:	United Kingdom	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Friday - Room 309 - 10:00 AM
Section:	Undergrad	**Poster:**	Zone 1 - 11

An investigation of the fine-tuning gene expression in E.coli to advance gene therapy applications

With the development of gene editing tools, such as CRISPR-Cas9, TALENS and Zinc finger nucleases gene therapy has become sophisticated enough to be clinically applied. Multiple gene therapy delivery systems are currently available, including viral vectors, but their clinical use is impeded by the capacity of these delivery vehicles. In addition to these gene editing technologies, RNA-mediated regulation of gene expression is another widely used application for gene therapies.The aim of our work was to investigate the fine tuning mechanisms for gene expression and synthetically engineer bacterial short RNAs to precisely regulate protein translation. We measured the level of the GFP protein fluorescence in E.coli with each sRNA BioBrick we created and have demonstrated that the gene expression level can be sufficiently regulated. Our molecular constructs and approach can be used to regulate the ratio of viral capsid proteins to advance novel gene therapy applications.

KOREA

Location:	Korea	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 311 - 11:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 17

Light Medicine: Optogenetics as an Epic Therapeutic Strategy for Parkinson's Disease

We are currently developing a treatment for Parkinson's disease utilizing optogenetics. There were several difficulties in existing methods, such as drug tolerance and other side effects, so we pinpointed the spatiotemporal accuracy of optogenetics as a better solution. We are approaching in two ways. First, we fused protein consisting of opsin and DRD2(dopamine receptor). Light act as DRD2 agonist, thus it triggers the nigrostriatal pathway. The light increases dopamine signaling in PD patient's brain. Second, we regulated the expression of ABAT by using the CRISPR-dCas9 system. It prevents neurodegeneration by inactivating GABA, which transmits an excessive inhibitory signal. Moreover, this system is reversible so it is capable of resolving the problem induced by GABA deficiency. If this project is fully developed and applied, it can cure not only PD but also addiction, schizophrenia, and other neurodegenerative diseases.

Korea HS

Location:	Korea	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 309 - 11:30 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 55

Designing a Hyperstable Antibody with Cell-penetrating Peptide for Intracellular Targeting

Antibodies are used to treat diseases, but their targets are limited to cell surface receptors because crucial disulfide bonds are broken in reducing environments. scFv(P5) is an example of 'hyperstable' antibody that maintains its function in reducing environments. We attached Cell-penetrating peptide(CPP) to the N-terminus of scFv(CPP-scFv(P5)) to design hyperstable scFv(P5) that can penetrate the cell membrane. CPP-scFV(P5) was expressed and purified using affinity and size-exclusion chromatography to check if CPP-scFV(P5) binds lysozyme, the target protein. Immunofluorescence(IF) showed CPP-scFv(P5) can penetrate the cell membrane. Through modeling, we grafted CDR regions of anti-Ras antibody to scFv(F8) to make hyperstable scFv that can recognize Ras. We performed homology modeling of engineered scFv using Modeller and showed our model is structurally similar to anti-Ras antibody. Our experiments demonstrate hyperstable scFv with CPP can go into the cell and function in reducing conditions. This opens opportunities for developing antibodies that target intracellular proteins.

KU LEUVEN

Location:	Belgium	**Track:**	Manufacturing
Region:	Europe	**Presentation:**	Sunday - Room 306 - 9:30 AM
Section:	Undergrad	**Poster:**	Zone 2 - 117

OCYANO - The development of two low-input photosynthetic systems for sustainable protein production

Traditional biosynthesis platforms such as E. coli and yeast require external energy supplies, commonly in the form of sugars or starch. Besides the economic cost associated with these energy sources, such systems are often not considered durable. Indeed, the production processes of sugars and starch are energy inefficient and farmland intensive. To circumvent these issues, photosynthetic systems like cyanobacteria and algae have been gaining increasing interest for biosynthetic purposes as they require only light and CO2. With our project, OCYANO, we present two new cyanobacterial technologies for protein production. The first design comprises the production and secretion of proteins in an ultra-fast growing cyanobacterium. The second system relies on a cyanophage for the conversion of its host's biomass to the protein of interest. Along with wet-lab exploration of these platforms, the economic and ecological relevances of both systems were investigated and compared to state of the art biosynthesis platforms.

KUAS Korea

Location:	Korea	**Track**:	Diagnostics
Region:	Asia	**Presentation**:	Friday - Room 312 - 9:00 AM
Section:	Overgrad	**Poster**:	Zone 3 - 258

BTS : Bioluminescent Tatoo for Stress detection

Like humans, animals experience stress but can't communicate even if they do. This can severely compromise animal welfare and animal rights. To address this issue, our goal is to make an eukaryotic bioluminescent system that detects stress in animals. To be more specific, if a target's level of cortisol rises to a certain level, our system will get triggered, causing its skin to light up. This will enable people to visibly check if animals are under stress, helping them to identify and eliminate possible causes of animal stress. To achieve this, we employed a newly discovered fungal bioluminescent system to design and construct a genetic circuit that detects cellular signals. Our project also includes mathematical modeling of the bioluminescent system to reach a desired outcome. Furthermore, we intend to apply our system to humans as well and hope to provide an effective stress□managing system for people in the future.

Kyoto

Location:	Japan	**Track**:	Environment
Region:	Asia	**Presentation**:	Saturday - Room 306 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 1 - 87

myClothes' Plastic -Solving water contamination One wash at a time!-

Microplastics are tiny pieces of plastic accumulating in the environment, and harmful to ecosystems. They are produced in many ways, including washing-clothes processes. Microfibers from clothes are released into wastewater and eventually flows into the ocean without being processed. Our project aims to capture microfibers from household washing machines. To achieve this, we used encapsulins - protein-made spherical nanostructures - which can be engineered to display other proteins on their surface. We designed encapsulins which display proteins binds to plastic and microorganisms found in wastewater treatment plants. We picked up some proteins as plastic-binding proteins, and compared them with each other. In our strategy, microfibers may then be bound to microorganisms through engineered encapsulins and settled in sedimentation basins. This therefore avoids the introduction of GMOs into wastewater treatment processes. Combined with plastic-digesting enzymes, we believe our approach represents an effective way to deal with a common source of microplastics.

LACAS BioBots

Location:	Pakistan	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 313 - 5:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 10

Producing Safflower Dye

We plan on bioproducing safflower dye to replace synnthetic dyes in the industry and reduce chemical waste pollution. We will also be looking to why safflower growth is being reduced in Pakistan.

Lambert GA

Location:	United States	**Track:**	High School
Region:	North America	**Presentation:**	Sunday - Room 306 - 3:00 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 62

LABYRINTH: Illuminate the Problem ‘ Navigate the Solution

Soil-transmitted helminthiasis infects 1.5 billion people globally. The prevalence and persistence of parasitic worm infections stem from poor sanitation infrastructure and a lack of affordable diagnostic tools. LABYRINTH, a helminth detection system, implements low-cost hardware devices, biosensor toehold switches, and software analysis to diagnose helminthiasis. Using Caenorhabditis elegans as a model organism for infectious helminths, LABYRINTH isolates and lyses helminth eggs using a frugal filter and homogenizer. Biosensor cells detect C. elegans by targeting the lin-4 gene with an RNA toehold switch. If transcribed, the toehold switch activates GFP expression, indicating the presence of helminth eggs in the sample. The FluoroCents app quantifies fluorescence and maps this data onto a cloud-based service, enabling health organizations to efficiently allocate targeted anthelmintic medications. LABYRINTH has the potential to improve the quality of life for over a billion people worldwide by illuminating the chronic nature of helminthiasis and increasing the affordability of diagnostics.

Leiden

Location:	Netherlands	**Track**:	Manufacturing
Region:	Europe	**Presentation**:	Friday - Room 312 - 3:30 PM
Section:	Overgrad	**Poster**:	Zone 2 - 216

S.P.L.A.S.H - Suckerin Polymer Layer to Achieve Sustainable Health

Severe burn wounds constitute a major public health problem causing 300,000 casualties annually. Besides fatalities, 11 million victims are hospitalized, of which many are left with lifelong disfiguration and disabilities. Donor skin, used in current treatments, is scarce due to specific characteristics and many processing steps leading to high demand for alternative treatments. One interesting alternative is the use of a novel biomaterial recently found in the Humboldt squid suckerin protein. Suckerin assets unique features such as flexibility, strength and ability to self-assemble into β-sheets, making it ideal for hydrogel formation. Since molecular engineering enables cheap, fast and high-yield production within microorganisms, we thrive to produce a suckerin-based hydrogel as a donor skin substitute. Introducing a linker system enables the joining of antimicrobial peptides, numbing agents and wound healing stimulators. Therefore, our suckerin-based hydrogel can improve the prognosis for burn wound victims by both preventing infections and promoting skin healing.

Lethbridge

Location:	Canada	**Track**:	Manufacturing
Region:	North America	**Presentation**:	Sunday - Room 310 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 123

Algulin: a low-cost oral insulin produced and administered in microalgae.

Diabetes, a disease caused by abnormal insulin regulation and production, affects approximately 8.8% of the population. Currently, subcutaneous injection of recombinant insulin is used to self-regulate abnormal blood glucose levels, a treatment that is painful and often prohibitively expensive for patients. Oral insulin alternatives are not yet a cost-effective alternative because the unprotected insulin is rapidly degraded by acidic stomach conditions and so there remains an unmet demand for low-cost methods of manufacturing oral insulin and/or novel methods for delivering insulin directly to the intestines. We are developing an edible recombinant microalgae strain called ‘Algulin’ that produces either an ultrastable oral insulin analog or proinsulin peptides. Algulin reduces manufacturing costs by eliminating the need for insulin extraction and purification, improves efficacy over previous oral insulins by acting as a protective capsule and shielding the insulin from degradation, and eliminates uncomfortable injections for diabetic patients.

Lethbridge HS

Location:	Canada	**Track:**	High School
Region:	North America	**Presentation:**	Saturday - Room 313 - 10:00 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 30

CADAR: CRISPR-Assisted Detection and Removal of pathogenic organisms disrupting the microbiome

Although present antibiotics are credited with improving the health of millions, antibiotic-resistant bacteria are a great threat to human health. Additionally, current antibiotics can cause harm to the human microbiomes due to delayed or misdiagnosis. Therefore, alternative detection methods and antimicrobials should be investigated. We propose the use of a CRISPR-Cas13a system for rapid detection and specific targeting of pathogens. CRISPR-Cas13a can target and cleave a strain-specific RNA sequence. The cleaving of the target RNA sequence will initiate non-discriminant cleavage of surrounding non-target RNA. Our system will report the presence of a pathogen by a visible colour loss due to the collateral cleavage of fluorescent RNA Mango. Furthermore, our alternative antimicrobial will consist of an engineered phagemid that encodes for the CRISPR-Cas13a system, which when inserted into a chosen bacteriophage can then infect pathogenic bacterial cells in the human body; thereby destroying the targeted bacteria through collateral RNA cleavage.

Linkoping Sweden

Location:	Sweden	**Track:**	Therapeutics
Region:	Europe	**Presentation:**	Saturday - Room 304 - 11:00 AM
Section:	Overgrad	**Poster:**	Zone 2 - 125

Novosite - A novel and modular antimicrobial bandage

Burn wounds are being treated with high doses of antibiotics which are used systemically and does not treat the affected area. The mortality rate of burn victims after surviving the primary trauma is mainly caused by infections and bacteria prone to antibiotic resistance. The purpose of this project is to produce an antimicrobial bandage of a cheap and environmentally friendly material which in this case is cellulose but can be applied to other materials as well, such as chitosan and alginate. Antibacterial peptides and lysins are attached to this bandage via a carbohydrate binding domain. The agents are released upon exposure to thrombin which is present in the patient's own blood. Therefore, the bandage could be an alternative to antibiotics or to an extent decrease the amount needed. The antibacterial spectrum of the bandage can either be broad through the use of antimicrobial peptides, or narrow by utilizing bacteriophage lysins.

Lubbock TTU

Location:	United States	**Track**:	Manufacturing
Region:	North America	**Presentation**:	Friday - Room 210 - 5:30 PM
Section:	Overgrad	**Poster**:	Zone 1 - 37

Exploring E. coli as a Platform Strain for the Biosynthesis of Tropane Alkaloids

The vast chemical diversity of plant specialized metabolites has provided a historically long-standing avenue for humankind to access natural products with pharmacologically active properties. Many plants that were domesticated during ancient times for their medicinal and psychoactive value are currently known to produce nitrogenous bicyclic phytochemicals classified as tropane alkaloids (TAs). Examples of notable TAs include atropine and scopolamine, which are listed as essential medicines by the World Health Organization, and even the notoriously addictive stimulant, cocaine. The commercial demand for TAs is largely supplied through plant extraction as the enzymes responsible for the formation of tropinone, an intermediate metabolite central to the biosynthesis of many TAs, were controversial for nearly a century. With the recent elucidation of these enzymes and the increasing global demand for medicinal TAs, we investigate the potential of E. coli as a platform strain for the biosynthesis of TAs.

Lund

Location:	Sweden	**Track**:	Food and Nutrition
Region:	Europe	**Presentation**:	Saturday - Room 304 - 5:30 PM
Section:	Overgrad	**Poster**:	Zone 1 - 8

Investigation in toxic metal remediation using genetically modified probiotics

Toxic metals cause various health problems to our population. We propose to remedy long-term poisoning with Prodeacc - a genetically modified probiotic bacteria absorbing and accumulating toxic metals for you. By introducing proteins found in Cupriavidus metallidurans and E. coli K12 to a probiotic chassis, Escherichia coli Nissle 1917, our transgenic bacteria could accumulate arsenic and lead. As shown in our model, this has the potential of relieving the user from harm caused by the toxic metals. The following proteins were inserted into a pUC19 plasmid and used for the accumulation of lead: pbrD, pbrT, alongside a T7 and Tac promoters.For arsenic, the following proteins were used: arsR, a fusion of arsR and MBP (maltose-binding protein) protein, alongside a T7 and Tac promoters.

LZU-CHINA

Location:	China	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Sunday - Room 310 - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 234

No-Returning Route of Pancreatic Cancer

Adenocarcinoma is a malignant tumor that is difficult to diagnose and treat. We designed a system which can generate different responses by judging the current state of cells to improve the efficiency of diagnosis.We used a regulatory line of protein-protein interactions to achieve this aim. We extracted TIL cells from the patient's cancer cells and then injected the engineered TIL cells back. TIL cells can target cancer cells, while exosomes automatically encapsulate mRNA and send it to cancer cells. If the cells are normal, the system won't start; if only a few cells are cancerous, the system will increase the amount of ALKBH5 through the ras-raf pathway receptor to attenuate the expression of the wnt pathway; if a large number of cells have undergone cancer, the system will initiate an apoptosis program through the hypoxia-inducible factor system, releasing a large amount of casp3 to promote apoptosis of cancer cells.

Macquarie Australia

Location:	Australia	**Track**:	Energy
Region:	Asia	**Presentation**:	Sunday - Room 313 - 11:30 AM
Section:	Overgrad	**Poster**:	Zone 2 - 207

HyDRA: Hydrogen Detection for Real Applications

Australia is positioned to become a world leader in hydrogen production and export by 2030. Hydrogen gas detection is notoriously challenging, being odourless, colourless and explosive at low concentrations (4%). From the canary in the coal mine, to the advanced gas detection equipment available today, the reliable detection of dangerous gas leaks remains of paramount importance. Hydrogen gas detectors are prone to cross-sensitivity due to the presence of other gases interfering with the measurement. Team HyDRA designed a highly specific hydrogen gas biosensor using Escherichia coli, containing a NiFe hydrogenase, cyclic-di-GMP riboswitch and cyclic-di-GMP phosphodiesterase. We designed this system to produce a fluorescent signal upon the detection of sufficient hydrogen gas to be considered a safety threat (40,000 ppm). Consultations with fire rescue, gas production and pipeline industries have guided us to design a prototype, resulting in a safe, reliable and efficient alternative method for quantifying hydrogen gas.

MADRID UCM

Location:	Spain	**Track:**	Diagnostics
Region:	Europe	**Presentation:**	Saturday - Room 302 - 11:30 AM
Section:	Undergrad	**Poster:**	Zone 2 - 138

AEGIS: Aptamer Evolve for Global InSitu Sensing

Waterborne infectious diseases kill thousands in developing countries every year. This project develops an affordable and easy-to-use early-detection system for cholera suited for such countries.Our technological base is aptamers: single-stranded DNA molecules engineered to interact with specific disease proteins. We integrate them into two kind of sensors: lateral-flow-analysis for ultra-low-resource areas, and electrochemical sensors for electricity-enabled areas.Furthermore, with our automated aptamer-discovery protocol (Robo-SELEX), we enable future targeting of different diseases. For characterizing the resulting aptamers We have also developed a deep-learning computational folding and an automatic kinetic characterization protocol.Disease-prevention have always a socio-political dimension. We have also undertaken on-the-ground research in Cameroon, together with local people and scientists, to identify the actual needs that must be addressed and adapting the design of the final sensor to them. Our project is both interdisciplinary and intercultural, which takes us further than the simple sum of our parts.

MADRID UCM HS

Location:	Spain	**Track:**	High School
Region:	Europe	**Presentation:**	Friday - Room 309 - 9:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 32

A Synthetic Biology Approach for the Sustainable Production of Stable Inks

The use of natural and sustainable inks in many different applications such as printer cartridges, pens or textile dyeing is currently limited by two important factors. On the one hand, although pigments can be extracted and purified easily from fruits or vegetables, the use of food for these purposes is not a sustainable practice. On the other hand, natural pigments are prone to oxidation, which severely affect color stability. Therefore, as a proof of concept, we propose a synthetic biology approach in which bacteria are genetically programmed to synthesize enzymes capable of catalyzing the transformation of color precursors into pigments. Oxidation of these pigments can then be prevented by either chemical or physical strategies. We explore both the use of a yeast cell-free system as a chemical anti-oxidant and the encapsulation of the resultant pigments to prevent their oxidation using physical barriers.

Manchester

Location:	United Kingdom	**Track:**	New Application
Region:	Europe	**Presentation:**	Saturday - Room 304 - 3:00 PM
Section:	Undergrad	**Poster:**	Zone 3 - 263

Using genetically engineered E.coli to synthesise alternative hair care products.

Current hair dyes contain many toxic chemicals i.e. Ammonia, which breaks open the outer layer of the hair to allow dyes to penetrate. These chemicals also cause severe allergic reactions and irreparable hair damage.The University of Manchester iGEM team hopes to tackle this problem by genetically engineering E.coli that binds to hair and secretes hair dyes in situ. The coloured proteins have hydrophobic tags that will allow them to anchor onto hair without breaking the cuticle. We have also taken this opportunity to integrate reparative and fragrant compounds to our product. Research has found that the 'pepG decapeptide' can infiltrate the hair and reform disulphide bonds, effectively straightening and repairing hair. We have also worked on integrating limonene and vanillin production into our E.coli to make the hair fragrant.The combination of hair dyes, reparative and fragrant compounds means that our product will be an all-round hair care product.

Marburg

Location:	Germany	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Friday - Room 302 - 9:30 AM
Section:	Overgrad	**Poster:**	Zone 3 - 252

Green Revolution - Establishing the fastest growing photothrophic organism as a chassis for synthetic biology

While most iGEM teams were working with conventional chassis like E. coli and S. cerevisiae, phototrophic organisms were always underrepresented. To make it more feasible for other teams to work with phototrophic organisms, a fast growing and easy to handle chassis is necessary.For this purpose we establish Synechococcus elongatus UTEX 2973 with a reported doubling time of 90min - as a viable chassis by developing strains tailored to various applications. Therefore, we restore its natural competence, establish the CRISPR/Cpf1 system for multiplexed genome engineering and enable the utilization of plasmids as a tool for rapid design testing. Furthermore, we expand last years' Golden Gate based MoClo toolbox, and accelerate the complete cloning workflow by automating plating, colony picking and plasmid purification on the Opentrons OT-2. By providing our fast phototrophic chassis to the community, we would like to pave the way for other phototrophic organisms in synthetic biology.

Michigan

Location:	United States	**Track**:	Food and Nutrition
Region:	North America	**Presentation**:	Sunday - Room 309 - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 223

Got Milk? Reducing Food Waste with AHL Detection

Expiration dates on food reflect the range of time when products are at their best nutritional value. To prevent consuming spoiled products, many consumers throw food away after the expiration dates. However, these dates are not an accurate indicator of spoilage, and this ambiguity adds to the food waste problem. To mitigate this, we developed a paper-based biosensor that consumers can use at home to assess their milk for spoilage. Our device detects the quorum-sensing molecules, acyl-homoserine lactone (AHL), produced by spoilage bacteria, both of which increase in concentration as spoilage progresses. Our detection system visualizes high AHL levels with the expression of pigment proteins. Additionally, to ensure food safety, a cell-free system was implemented such that no live genetically-engineered bacteria will be introduced to the consumer product.

MichiganState

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Saturday - Room 304 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 3 - 265

Reduction of Greenhouse Gases via Genetic Modification of Methanotrophic Bacteria

This project aims to generate a bacterial chassis capable of utilizing the methane produced within landfills, usually an anaerobic environment, and to convert the methane into an industrially-useful compound. To achieve this, we will genetically modify Methylomicrobium alcaliphilum 20Z, that converts methane gas to 2,3-butanediol, in order to oxidize methane under anoxic conditions. Further, a 3D printed bioreactor will be tested and modeled to grow the bacteria in biofilms to be cultivated in landfills.A byproduct, formate, can build up in the bioreactors, acidifying the environment and potentially impairing biofilm growth. To prevent this, a formate biosensor will be engineered, causing cells to fluoresce when concentrations are high. We plan to limit plasmid transfer by using a modified toxin-antitoxin system. Alongside our outreach efforts, our project has aimed to increase efficiency and safety of implementing an engineered methanotrophic bacteria into natural environments.

Mines

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Saturday - Room 311 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 3 - 251

Molecular Mining of Cadmium: Detecting and Binding Cadmium for Bioremediation

Heavy metal contamination at current and former mining sites is a significant environmental and human health problem. Cadmium (Cd) is one of the 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 bone deterioration. We are developing a rapid and efficient cadmium sensing and binding system that is capable of detecting cadmium down to 10 μM concentrations. When exposed to a minimum concentration of Cd, the E.coli cells express the green fluorescent protein (GFP). After Cd is detected, a metallothionein protein binds to it and sequesters it in the periplasmic space of 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.

Mingdao

Location:	Taiwan	**Track**:	High School
Region:	Asia	**Presentation**:	Friday - Room 313 - 4:30 PM
Section:	High School	**Poster**:	HS Zone 2 - HS 59

Indoor Air Freshener 2.0

Indoor air pollution could be worse than outdoor air. That's why people buy air purifiers at home. Yet, CO2 and VOCs cannot be eliminated by any current machine. Algae purification system is increasingly getting attention but with limited efficiency. This year, we improve the system significantly by combining a photobioreactor device and algae culture media supplemented with natural enzymes. We produce carbonic anhydrase (CA) to enhance CO2 dissolving rate, as well as CYP2E1 to break down chloroform and benzene. The resulting molecules can easily be taken up by algae. Our device sets up with a nano bubble generator, high power LED light, and CO2/O2 sensors to optimize photosynthesis and analyze air quality, and as small as a portable 1L water bottle.In addition, we used mathematical modeling to simulate the application in the real world. We believe it will be the most common air purifier in our life.

Missouri Miners

Location: United States
Region: North America
Section: Undergrad

Track: Open
Presentation: Saturday - Room Ballroom A - 3:30 PM
Poster: Zone 2 - 178

The Geneticist's Cell

More than anything, the goal for our project was education. Genetic engineering is an incredible tool. However, it is often met with misunderstanding. We wanted to make genetic engineering more approachable. What better way to demystify the topic than by presenting it through familiar magic? Our plan is to develop a 'House Cup', straight out of Harry Potter. We plan to develop four strains or 'houses' of E. coli that secrete distinct quorum sensing signaling molecules. Another strain would then have receptors for each signaling molecule. In response to each signal, it would fluoresce a corresponding color. The House color most expressed wins the Cup! We are then presenting genetic engineering projects to several different groups to survey public knowledge on the topic. This will better our approach in providing pertinent information. Making genetic engineering approachable will ideally help anyone to make informed decisions about its place in our world.

MIT

Location: United States
Region: North America
Section: Undergrad

Track: Foundational Advance
Presentation: Friday - Room 312 - 5:00 PM
Poster: Zone 2 - 180

The Perfect Swarm: Directed Attraction of Neutrophil-Like Cells through Engineered Chemokine Secretion

Cell coordination within a population depends on an individual cell's ability to accurately receive and respond to extracellular stimuli from the environment and neighboring cells. Coordinating cellular motility, where cells move in response to external cues, is central to many physiological responses. For example, human neutrophils demonstrate migratory behavior towards chemokine gradients as part of the adaptive immune system. Here, we present a mechanism to harness cellular chemotaxis to control cellular swarming and directed movement. We engineered human embryonic kidney (HEK) cells to secrete chemokines that induce chemotaxis in unengineered neutrophils. To evaluate chemotaxis, we first differentiated HL-60 cells into chemotactic neutrophils. We then introduced chemokines produced by our engineered HEK cells and evaluated neutrophil movement utilizing several cellular migration assays. We anticipate our engineered system will provide insight into how immune systems develop as well as form a preliminary toolbox for recruiting mammalian cells selectively in tissue engineering applications.

MITADTBIO Pune

Location:	India	**Track:**	Environment
Region:	Asia	**Presentation:**	Friday - Room 210 - 2:30 PM
Section:	Undergrad	**Poster:**	Zone 3 - 233

PEred: Solving plastic based menstrual waste crisis using synthetic biology.

The aim of this project is to create a genetically modified bacterium that has the capability of releasing extracellular degradation enzymes to degrade polyethylene (PE) based sanitary pads. The bacteria will be engineered to sense K+ ions found after RBC lysis from menstrual blood would upregulate the expression of polyethylene degrading laccase enzyme and biofilm production CsgD gene. The proof of concept will be shown in Escherichia coli. Successful transformation of these genetic components can lead to a novel and eco-friendly way of dealing with colossal amounts menstrual waste produced each year.

Montpellier

Location:	France	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Sunday - Room 312 - 11:30 AM
Section:	Overgrad	**Poster:**	Zone 2 - 175

KARMA, a new tool for specific protein degradation

The discovery of the CRISPR tool has led to a real revolution, allowing genome editing to be controlled in a very specific way. However, this type of tool is not available when it comes to proteins. The first aim of the KARMA project was to create a new tool for specific protein degradation. In order to accomplish that, we thought about using a non-specific protease, to which we add a VHH that will act as a research head to make it more specific, and targeting a protein in a complex environment. We chose to perform a complete proof of concept using well-known systems, the TEV protease and a VHH against sfGFP, to characterize in detail whether this type of tool could be effective. We then considered the possible applications of this tool, particularly to counter the antibiotic resistance caused by outer antibiotic degrading-enzymes like beta-lactamases.

Moscow

Location:	Russian Federa-	**Track**:	Diagnostics
Region:	Europe	**Presentation**:	Sunday - Room 311 - 9:00 AM
Section:	Overgrad	**Poster**:	Zone 1 - 47

LymeExpress - a portable biosensor for Lyme disease pathogens in ticks

Each year around 500,000 Lyme disease cases caused by tick-borne Borrelia spp. are reported worldwide. Prompt detection of Borrelia infection is crucial for effective treatment. Quick point-of-care detection of the pathogens in an extracted tick is therefore important.To solve this problem, our team proposes a portable biosensor device that can detect the presence of Borrelia spp. in ticks - LymeExpess. It comprises tick homogenization followed by detection of pathogen-specific DNA motifs. The detection is based on using specially engineered dCas proteins from various organisms fused with split domains of beta-lactamase. The dCas complexes target the complementing split domains to the nearby DNA locus allowing for the fully functional reporter protein to be formed. The products of the colorimetric reaction catalyzed by the protein are detected with an embedded spectrophotometer. This yields an easy to use, cost competitive and quick testing device that can be used even in field conditions.

MSP-Maastricht

Location:	Netherlands	**Track**:	New Application
Region:	Europe	**Presentation**:	Sunday - Room 311 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 131

The RocKit

The Receptor Open Community Kit, or RocKit, takes an innovative new approach to synthesize customised receptors. The RocKit provides researchers with a way of creating receptors for any target and access to a database containing information about all receptors made with the RocKit. Our kit is easy to use, containing all the cells, DNA and buffers to utilise this technology. The system is carried out in yeast which are transformed with the genes for all components in the genetic circuit. We use a system of directed random mutation to simulate accelerated evolution to the binding site of the receptor until it evolves an affinity for the specific target molecule of choice. Our base receptor is designed in such a way as to allow for easy extraction for use in experimentation. All receptor sequences can then be uploaded to the RocCloud to facilitate the creation of an open, information-sharing scientific community.

Munich

Location:	Germany	**Track**:	Diagnostics
Region:	Europe	**Presentation**:	Saturday - Room 210 - 5:00 PM
Section:	Overgrad	**Poster**:	Zone 2 - 155

ALiVE – Analysis of Living cells via Vesicular Export

There is an increasing demand in biomedical research for techniques to monitor the dynamics of multiple genes over several time points. However, current methods such as gene reporters are limited to a few genes of interest or require sample destruction in the case of transcriptomic analysis. We thus engineered ALiVE as a diagnostics platform for the Analysis of Living cells via Vesicular Export. In particular, we adapted the mechanisms of exosome secretion and viral budding to export specific transcripts from living cells repeatedly over time. Based on versatile BioBricks, we generated bio-orthogonal RNA-adapters and modified membrane proteins with affinity tags to enable convenient purification of the exported RNA. We also introduced sensitive luciferase reporters to quantify vesicle secretion efficiency and collateral transfection. ALiVE is a generalizable technology for minimally invasive diagnostics of gene expression dynamics in cellular model systems and holds great promise for monitoring cellular therapies in regenerative medicine.

Nanjing

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Saturday - Room 210 - 9:00 AM
Section:	High School	**Poster**:	HS Zone 1 - HS 1

Anti-Aphid Angiosperm: use cotton chitinase gene to resist pest invasion

Our project uses agrobacteria to produce chitinase in tobacco leaves in order to help resist insect's infection. Chitin is the composition of insects' exoskeleton and digestion tract. Chitinase can decompose chitin and hence reduce insect infection. This method can be used as a 'green pesticide' which doesn't damage the environment. The agrobacteria can transfer part of its plasmid into plant genome, which is the T-DNA. We inserted the chitinase gene into the vector pCAMBIA 2301 and adopted a binary system. We first let the vector amplify in E.coli DH5α. Then, we extracted the plasmids and inserted them into agrobacteria tumefacien GV3101. The bacteria can be injected into tobacco leaves and contribute to a brand new ability to defend against pests.

Nanjing High School

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 302 - 3:30 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 58

Light-Catch: An engineered microbe that records blue light exposure time

In China, with the popularity of electronic devices, we spend more time in front of electronic display screens. However, the blue light emitted by the display screen is extremely harmful to our health. Here, we develop a type of micro-organism that can record the length of time it is exposed to blue light. We find that Cas1-Cas2 complex which proteins in the process of cutting and inserting DNA fragments into CRISPR array, can be restrained by Thermobifida fusca (Tfus) Cas3. We construct plasmids with Cas1-Cas2 and Cas3 expression, and the Cas3 is built downstream of FixK2 promoter controlled by blue light sensor. Therefore, a quantitative relationship between the acquisition of new spacers of the CRISPR array in Cas1-Cas2 and the length of time that the bacteria are exposed in blue light is developed. Combining this technique with practical applications will yield a method to measure time of blue light emitting.

Nanjing NFLS

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 306 - 3:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 35

Cancer Immunotherapy with 'Trojan Horse' Antigen

Neoantigen is an immunogenic peptide formed by mutations in tumor cells and it is an ideal target for cancer immunotherapy. However, natural neoantigen is highly heterogeneous and difficult to identify. Here, we designed an artificial neoantigen with high immunogenicity, which could allow tumors to be recognized and killed by the immune system. We named this artificial neoantigen as Trojan horse antigen.In this project, we constructed a Trojan horse antigen expression system: pCDNA6.2-hTERT-HBsAg-EmGFP-miR-HBsAg and a specific activation system in tumor cells: PCDNA3.1(+) - Hulc-CeR-HBsAg. These two systems, which contain cancer-specific promoters and miRNA, form an AND gate for regulating the expression of the Trojan target antigen only in liver cancer cells, but not in normal cells. Then the human immune system will kill tumor cells by identifying Trojan horse antigen-specific.

Nanjing-China

Location:	China	**Track:**	Environment
Region:	Asia	**Presentation:**	Saturday - Room Ballroom A - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 3 - 221

A new method for the removal and reutilization of Phosphate in the sewage

Our team is trying to figure out an innovative way to process the sewage and therefore generate energy for the growth of crops. We develops a simple solo medium-copy plasmid-based polyphosphate kinase (PPK1) overexpression strategy for achieving maximum intracellular polyphosphate accumulation by environmental bacteria. In the inorganic experiments, we will find the suitable concentration of phosphate radical□pH, and mole ratio of ions involved in the synthetic reaction of struvite. In the engineering experiments, we will design an integrated waste water processing device, which can remove phosphorus from sewage, and utilize the engineered bacterias to release phosphorus in other areas to produceprecipitate. In agricultural experiments, we will use our products as fertilizers, and compare them with chemical fertilizers.

Nantes

Location:	France	**Track:**	New Application
Region:	Europe	**Presentation:**	Sunday - Room 309 - 11:30 AM
Section:	Undergrad	**Poster:**	Zone 2 - 145

Bio'Clock - Controlling gene expression over time with sugars

E.coli consumes non-glucose sugars according to a specific hierarchy. We used this hierarchy in our project to monitor the duration of gene expression. To create our tool, we built four plasmidic constructs: each containing a sugar-responsive promoter (pLAC, pSRL, pARA or pRIB) upstream ofa fluorescent reporter protein (GFP, CFP, RFP or YFP). With these constructs, we characterized the activity of the promoters in different conditions, varying the medium composition, the concentrations of sugars, the temperature and the pH. It allowed us to build a model predicting the amount of sugar needed in the medium to trigger gene expression at a certain time and for a certain duration. This fundamental tool could be used in a wide variety of fields such as administration of medicine.

NAU-CHINA

Location:	China	**Track:**	New Application
Region:	Asia	**Presentation:**	Friday - Room 306 - 11:30 AM
Section:	Undergrad	**Poster:**	Zone 1 - 97

Mars

Malaria parasite, with powerful invasive ability, can rapidly multiply and cause acute damage to the human body. It is widely known that mosquito plays host to malaria. Traditionally, people control malaria by killing mosquitoes using drugs. However, this may give birth to drug-resistant mosquitoes. In the meanwhile, killing may jeopardize the stability of the niche of mosquitoes. Our project hopes to find a new way entitled 'MARS' in synthetic biology to control malaria. We engineer the symbiotic bacteria Serratia sp., which stably colonize in the mosquito's midgut, to produce various anti-plasmodium peptides and kill the plasmodium in their most vulnerable stage.We apply the polyprotein strategy in our project, and build gene passways to produce fusion effector protein and TEVp secreted by the alpha-hemolysin secretion system with different promotor combinations to acquire an ideal expression ratio with the aid from our modeling.

Navarra BG

Location:	Spain	**Track:**	High School
Region:	Europe	**Presentation:**	Friday - Room 311 - 9:00 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 4

Biogalaxy2: a project to produce plant biofactories for an extra-terrestrial environment.

In a previous project we developed a simple and cost-effective plant-based method for production and purification of recombinant proteins. The system was based on the production of 'GBSS::TP' plants transiently expressing a target protein (TP) fused to granule-bound starch synthase (GBSS) containing a unique cleavage site recognized by a specific protease that enables the TP to be separated from the GBSS into an aqueous buffer, while the GBSS remains embedded the starch granule. The cleaved TP can be highly purified upon a single and simple centrifugation step of protease-treatedplant tissues.The aim of this project is to improve the technology by producing plants stably expressing GBSS::TP that are capable of growing under challenging conditions of low gravity, high irradiance, etc. occurring in extra-terrestrial environments.The project involves the collaboration with the European Space Agency (ESA) and the Spanish National Research Council (CSIC).

NAWI Graz

Location:	Austria	**Track:**	Diagnostics
Region:	Europe	**Presentation:**	Friday - Room 311 - 3:00 PM
Section:	Overgrad	**Poster:**	Zone 1 - 63

Beeosensor

The American Foulbrood, caused by Paenibacillus larvae, is the most dangerous bacterial disease facing bees in Austria. The early diagnosis of the American Foulbrood requires a microbiological laboratory, which makes preventative monitoring unpleasant for beekeepers, especially for hobby-beekeepers. We seek to develop a biosensor in order to make it possible for anyone to measure for P. larvae in a relatively short period of time. The sensor should be easy to use, small, affordable and sensitive enough to detect small amounts of bacteria.Bacteriophages are immobilized onto an electrode to provide the necessary specificity. The binding of the P. larvae spores from the probe to the bacteriophages causes a change in the electrical resistance, which can be quantified by electrical impedance spectroscopy.

NCHU Taichung

Location:	Taiwan	**Track:**	Environment
Region:	Asia	**Presentation:**	Sunday - Room 210 - 9:30 AM
Section:	Undergrad	**Poster:**	Zone 2 - 194

Making Cloud out of Microbe: Strategy for Climate Regulation through Microbial Dimethyl sulfide

Though earth has been suffered from global warming, the strategies for moderating the phenomenon are still lacking. On the other hand, as it has been suggested that the effects of Dimethy-sulfide-derived aerosols provide a global climate feedback loop for climate cooling, while marine coccolithophore was found to produce dimethyl sulfide for forming cloud condensation nuclei (CCN) and accelerate clouds formation.Accordingly, we engineered a bacterial to express a novel DMS producing pathway to make clouds. We also optimize the system to let the bacterial performs carbon fixation capability.Making clouds out of engineered microbe could have better performance than algae do.We expect that this can efficiently release the tension of global climate extremes and solve the problem of water deficiency and dramatically cooling atmospheric temperatures as well.

NCKU Tainan

Location:	Taiwan	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Friday - Room 309 - 5:30 PM
Section:	Undergrad	**Poster:**	Zone 3 - 236

A comprehensive solution to CKD: OH MY GUT

Chronic kidney disease (CKD) is an emerging global health problem. The prevalence of kidney disease is increasing dramatically and the cost of treating this growing epidemic is an enormous burden on healthcare systems worldwide. Recent research has proved that the accumulation of uremic toxins like p-Cresol due to a failing kidney plays an important role in the worsening of cardiovascular and renal diseases. This year, iGEM NCKU Tainan aims to provide 'Oh My Gut', a comprehensive solution to this problem. We are developing an innovative life-saving therapy using engineered bacteria. We will be providing a biotherapeutic that can reduce p-Cresol production in the gut and a simple and cost-effective blood p-Cresol measuring device. Various measures have been taken to maximize biological safety, including gene knockout. With Oh My Gut, we can not only slow down the progression of CKD but also prevent complications and improve the quality of life.

NCTU Formosa

Location:	Taiwan	**Track:**	Environment
Region:	Asia	**Presentation:**	Saturday - Room 311 - 3:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 197

A Synthetic Biology-Based Mutagen Sensing system - E. Phoenix

Gene mutation can lead to cancer in human cells, however nowadays the detection of mutation is time-consuming and difficult. Thus, this year NCTU_Formosa develops an easy-use mutation detection and prediction platform with an education kit. We named it E. Phoenix. First, E. coli expresses the suicide gene. Once the suicide gene is mutated, the population will rise, and the RFP signal will show by Quorum Sensing. Next, the growth curve analytic model can transform the signal into mutation frequency. We also built up a mutation frequency prediction model based on chemical structure. We can compare the detection result from our device with already known mutagens. After collecting our results, we design an education kit to provide a more understandable data presentation. Different results from different samples turn into the speed of racing cars. By comparing its rate, the public can compare mutation frequency among different testing objects easily.

NEFU China

Location:	China	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Sunday - Room 313 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 154

Bacterium Oncologists: Guide Us to Cancer!

At the stages of high-burden tumors or metastasis, cancer patients may suffer from acute uric acid nephropathy due to rapid dissolution of tumor cells caused by conventional treatments, such as radiotherapy and chemotherapy. To solve the issue, we designed a novel and controllable system in E.coli Nissle 1917 that releases anti-tumor drugs in response to changes of uric acid levels, preventing the trouble of manual assessment and reduce the potential of acute uric acid nephropathy. Therefore, the tumor cells can be safely dissolved under the conditions of uric acid fluctuation within a physiologically tolerable range. Additionally, we designed a normal tissue-specific CodA expressing system, which can suppress bacterial growth with 5-Flucytosine administration. To enhance tumor elimination, we made bacteria express ftnA-M, a variant of ferritin iron storage protein, to attract engineered bacteria to tumor sites when exposed to a magnetic field.

NEU CHINA

Location:	China	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Friday - Room 304 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 1 - 72

A biological system to alleviate intestinal inflammatory diseases and prevent potential colorectal cancer

Our project is interested in utilizing genetically engineered Escherichia coli to relief symptoms of Inflammatory Bowel Disease (IBD). The engineered E.coli strain should include three characteristics, including precisely colonize in the inflammatory region; successfully express and secrete anti-inflammatory proteins; without any biological hazards or side-effects.Firstly, we designed several plasmid based-bio-sensors for detecting one of the IBD signals, nitric oxide. After a series of comparison, our experiments demonstrated that yeaR based NO sensor with the highest efficiency in E. coli Nissle 1917 strain.Secondly, we integrated two anti-inflammatory factors, interlukin-10 (IL-10) and myrosinase into the Yebf expression plasmid under the tunable-gain amplifier regulation.Lastly, for the biosafety concern, we designed the ‘kill-switch’ system which based on the mazE-mazF system, a natural toxin system found in E. coli that enable to kill bacteria under the low temperature trigger, once the anti-inflammatory E. coli was excreted out of the gut.

Newcastle

Location:	United Kingdom	**Track**:	Diagnostics
Region:	Europe	**Presentation**:	Sunday - Room 302 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 185

muninn: A Sensitive Approach to Parkinson's Disease.

Parkinson's Disease is a neurodegenerative disorder affecting an estimated 7 million people worldwide. Current diagnostic procedures rely on observations of late-stage motor symptoms, meaning delays and misdiagnoses occur. For individuals, this means therapies which delay the severity of Parkinson's Disease may not begin until physical symptoms are present. Our project, 'muninn', investigated the use of biosensors to detect pre-motor symptom biomarkers associated with Parkinson's Disease and how early diagnosis may impact patient health. The project development was informed by patient groups, health professionals and diagnosticians, resulting in a suite of biosensors targeting biomarkers found in clinical samples. We investigated CRISPR SHERLOCK system for detection of a Parkinson's Disease-specific mRNA biomarker, and biosensors for the detection of glutathione and eicosane to increase confidence in an indicative diagnosis. By integrating feedback from clinicians and charities, 'muninn' aims to provide a foundation for developing diagnostic procedures for early-stage Parkinson's Disease.

NJTech China

Location:	China	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Saturday - Room 312 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 201

TAT Trap

Breast cancer is the most common invasive cancer in women, with the recurrence rate up to 40%. Currently, the most advanced treatment for cancer is immunotherapy. Interleukin 2 (IL-2) stimulates the growth and activity of T-lymphocytes to boost immune system. Use of an inhibitor that blocks the interaction of PD-L1 with the PD-1 receptor can prevent the cancer from evading the immune system. Our product targets both IL-2 and PD-L1, implementing a trap between Tumor and T cells. We evaluate the efficacy of our bi-functional fusion protein by the binding assay and T cell proliferation assay, as well as killing assay. In order to solve the short half-life and acute toxicity of IL-2, we apply Poly-γ-glutamic acid hydrogels to encapsulate the fusion protein to achieve sustained release effect. This study sheds light on clinical treatment of breast cancer, improving the quality of life of postoperative patients.

Northern BC

Location:	Canada	**Track**:	Diagnostics
Region:	North America	**Presentation**:	Sunday - Room 302 - 4:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 200

Development of a biosensor to detect opioid contamination of non-opioid recreational drugs

Our team chose to take a harm reduction approach to address the opioid crisis affecting Canadians by building an opioid biosensor in Saccharomyces cerevisiae that can be used to test non-opioid recreational drugs for opioid contamination prior to consumption. We intend for the system to ultimately activate a transcription factor that will turn on production of a chromoprotein, producing a visible color in the presence of opioid. Since the signaling pathway used is anticipated to generate tremendous signal amplification as it passes through the endogenous machinery of yeast, we expect to be able to detect trace amounts of opioid contamination. The development of a biosensor that is capable of detecting small amounts of a variety of opioids in what is believed to be a non-opioid drug sample will allow users to modify their behaviour, whether this includes discarding the drugs, using with others present, or utilizing a monitored injection service.

Northwestern

Location:	United States	**Track**:	Diagnostics
Region:	North America	**Presentation**:	Saturday - Room 210 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 45

Building an Educational Kit for Visualizing UV-induced DNA Damage in E.Coli

As a result of various ozone-depleting substances progressively damaging our planet's atmosphere, UV exposure from sunlight is at an all-time high, resulting in an increased incidence of skin cancer in many populated areas. To increase the awareness of the potential health risks of extended UV exposure, we developed an educational kit that can visualize UV-induced DNA damage. Specifically, we utilized a global DNA repair mechanism, called the SOS response, which can be activated by a type of DNA damage known as cyclobutane pyrimidine dimers. Upon exposure to sunlight, the kit produces GFP via a UV-inducible promoter that is found in the SOS response pathway. An educational kit incorporating this low-cost and easy-to-use biosensor teaches students about the risks of UV exposure and how biology can be engineered to illustrate the impact of these issues.

Nottingham

Location:	United Kingdom	**Track**:	Food and Nutrition
Region:	Europe	**Presentation**:	Friday - Room 310 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 242

NoTox: Making Botulism prevention cheaper and more effective.

Our project aims to create Clostridium reporter strains that may be used to safely monitor the likelihood of botulinum neurotoxin production in food. Our proof-of-concept studies will use the non-toxic surrogate strain, Clostridium sporogenes, in place of the toxic Clostridium botulinum. This will be modified to produce a volatile reporter Acetone, under the influence of BotR (the transcription factor that controls production of Botulinum neurotoxin). The amount of acetone produced will, therefore, positively correlate with the amount of Botulinum toxin produced. This volatile solvent will be detected using a self-designed electronic nose, giving an accurate description of the level of toxin that would be produced. The system can then be used to test whether food packaging will support the production of botulinum toxin, serving as proof of concept that reporter-strain technology can be useful in botulism prevention.

NTHU Taiwan

Location:	Taiwan	**Track**:	New Application
Region:	Asia	**Presentation**:	Friday - Room 302 - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 102

FarFarmIA

Recently, excessive fertilization has become easier than fertilizing too little since the low price of synthetic fertilizer. Applying excessive fertilizer of crop requirement will harm crops and soil, moreover harming the environment and human health.Our project is aimed to give a solution to current agriculture problem. The two main problems we will solve are the lack of labor force in agriculture and over fertilization. Therefore, FarFarmIA (Far Farm Intelligence Agriculture) is designed. FarFarmIA is a smart farming system that contains two major product, the smart fertilizer and the IoT robot. Smart fertilizer can provide nutrition of crop requirement under different temperature and automatically fertilize the crops. On the other hand, IoT robot could provide real time detection on the soil texture, analysis the texture data and can help manage the farm land. By FarFarmIA, farmers can reduce the labor force demand and grow the crops better.

NTU-Singapore

Location:	Singapore	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Friday - Room 304 - 11:30 AM
Section:	Overgrad	**Poster:**	Zone 2 - 118

CasRx: More Than Meets the I

For iGEM 2019, we were inspired by feedback from the public, academics and doctors, who desired a safer way to correct disease-causing genetic mutations. Hence, our iGEM project aims to tackle this challenge by featuring RNA editing as a safer alternative to DNA editing. By incorporating feedback from our human practices, we decided to improve upon our RNA editing project from last year and include the analysis of off-targets as a safety component. We aim to identify a dCas13-ADAR2 (Adenosine deaminases acting on RNA) fusion protein that has high RNA editing activity and high specificity (low off-targets), with future applications in therapeutics and research.

NU Kazakhstan

Location:	Kazakhstan	**Track:**	Energy
Region:	Asia	**Presentation:**	Saturday - Room 309 - 4:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 121

A Circular BioEconomy: How Toxic Waste is converted into Nano-electrocatalysts and Fuel

Our project is focused on production of Hydrogen gas using transformed cyanobacteria Synechococcus Elongatus PCC 7942. We introduce 3 genes: HydA, HydG and HydEF. HydA is [Fe-Fe] Hydrogenase and other two proteins are maturation proteins. To improve production of hydrogen our team came up with several modification. First is to indroduce bacterial Rhodopsin that will pump protons to the site where peripheral HydA resides. Furthermore favorably fluorescent Carbon Quantum Dots can be added to redirect energy of light to rhodopsin thus increasing its pumping rate. Previously introduced SQR also can be used in this case to substitute for inactivated bu sulfide wastewater PSII providing protons and electrons from sulfide. Ultimately all biomass will be converted into graphitic catalytic material that can be use as substitute for platinum catalyst in PEM.

NUDT CHINA

Location:	China	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Sunday - Room 304 - 3:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 165

Engineered Hepatocytes for Glycemic Homeostasis Regulation

Type II diabetes mellitus (T2D) is now one of the biggest threats to human health. Previous studies have revealed the critical contribution of glucagon and glucagon induced hepatic gluconeogenesis in the hyperglycemia of T2D patient. Here we demonstrate a designer cell approach to control hyperglycemia by degrading hepatic Glucagon Receptors (GCGR) in a glycemic dependent manner. We achieved glucose responsiveness by synthetic circuits that couple endogenous CHREBP glucose sensing pathway to a CHREBP activating hybrid promoter controlling GCGR degrading elements. The degradation of GCGR was then executed by proteasome-based system in a Trim21 based, Trim-away alike manner. Circuit-carrying HepG2 cells showed significantly decreased GCGR level and glucogenic ability, similar results were obtained in primary mouse hepatocytes with adenovirus as delivery approach as well. Mathematical modeling also indicated the potentials of this circuit in long-term in vivo uses. This method may provide a promising strategy for T2D treatment in the future.

NUS Singapore

Location:	Singapore	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Sunday - Room 302 - 10:00 AM
Section:	Undergrad	**Poster:**	Zone 1 - 57

E.co LIVE: Engineering systems to control metabolic activity and protein production for sustainable Synthetic Biology

Engineered organisms are being used to solve global problems today, from cleaning up our environment to diagnosing diseases. Yet, bottlenecks in engineered microbes lie in their limited functional lifespan and inherent stochasticity. We aim to overcome these limitations by engineering an ‘on-off’ switch for the cells, giving the ability to control their productivity and extend their productive lifespan. Aided by modelling, we developed this switch using Toxin-Antitoxin modules which target global translational process and cellular metabolism to enable dormancy. Our technology allows the insertion of different input control modules to regulate these circuits in a plug-and-play manner. To ensure the safety and retainability of our circuits, a biocontainment module was designed to prevent the unwanted spread of our modules to other organisms. Finally, we successfully demonstrated regulated and lengthened productivity by using luminescence production. Our technology thus pushes the boundaries of Synthetic Biology, bringing it closer to real world adoption.

NWU-China

Location:	China	**Track:**	Diagnostics
Region:	Asia	**Presentation:**	Friday - Room 302 - 5:30 PM
Section:	Undergrad	**Poster:**	Zone 1 - 28

Bio-HPkuM (Bio-Household phenylketonuria monitor)

Clinicians require a simple quantitative method for the detection of both phenylalanine and tyrosine to facilitate the diagnosis of phenylketonuria, a common inherited disorder of amino acid metabolism.In our project, we designed a biosensor with RFP&GFP as a reporter gene to semi-quantitatively determine the amount of Phe&Tyr.But RFP&GFP require specific instruments to measure, so we use blue pigment protein (amilcp) and yellow pigment protein (fwyellow). By mixing the two proteins in different proportions and then using a computer for analysis, a simple color chart is created as a new reporting system.

NYMU-Taipei

Location:	Taiwan	**Track:**	New Application
Region:	Asia	**Presentation:**	Sunday - Room 309 - 11:00 AM
Section:	Undergrad	**Poster:**	Zone 2 - 156

DiseaScent: Odorant Biosensors for Detecting the Scent of Diseases

Volatile organic metabolites can be generated in many human samples through distinct metabolic pathways. Increasing research evidence indicates that patients' bodies give off unique Volatile Organic Compounds (VOCs) in different stages of human diseases. Therefore, VOCs are considered as potential biomarkers for performing non-invasive and patient-friendly disease screening in the early stages. This year, NYMU-Taipei iGEM team has taken tuberculosis disease as an example and created intracellularly expressed and surface-displayed odorant-binding proteins to detect and monitor the volatile biomarkers from the patients' bodies. We have immobilized expressed olfactory receptor proteins to paper device prototypes to detect heptanal which is a specific VOC from tuberculosis patients. Here, we provide an example to demonstrate the feasibility of using odorant biosensors to perform non-invasive early disease screening. Our device prototypes with immobilized olfactory receptor proteins show specific bindings with heptanal. This method is also friendly to children/babies and severely ill patients.

NYU Abu Dhabi

Location:	United Arab Emir-	**Track:**	Diagnostics
Region:	Asia	**Presentation:**	Sunday - Room 311 - 10:00 AM
Section:	Undergrad	**Poster:**	Zone 1 - 46

Volatect - Collect, Detect and Protect

Prevalence of international travel, anti-vaccination movements and high population density are all detrimental factors increasing the likelihood of infectious disease outbreaks in the 21st century. The ensuing possibility of worldwide pandemics leading to widespread human suffering and death is now tangible. Volatect is a point of care diagnostics device coupled with a results database and API, enabling the swift detection, surveillance and control of epidemic-prone diseases. The novel DETECTR technique, combining Recombinase Polymerase Amplification and CRISPR-Cas12, is applied to collected saliva samples on a proprietary microfluidic chip to detect a customizable assay of infectious diseases. Using modified fluorescence quenchers and carefully designed primers in combination with CRISPR technology allows high sensitivity and specificity of disease detection. Volatect provides a seamless sample collection and pathogen detection platform with the unique advantage of customizable real-time diagnostics data for outbreak tracking, epidemiological data gathering and building interactions with existing healthcare and travel databases.

NYU New York

Location:	United States	**Track:**	Manufacturing
Region:	North America	**Presentation:**	Saturday - Room 313 - 11:30 AM
Section:	Undergrad	**Poster:**	Zone 2 - 179

Optogenetic Flavonoid Biosynthesis in E. coli

Flavonoids are the largest phytonutrients found in plantae, well-known for their anti-cancerous, antioxidant components. A modern problem hampering access and usage of these molecules is difficulty in their isolation and quantification. This calls for optimization either through pathway engineering or possibly finding a new approach to isolate and extract these molecules. The NYU iGEM laboratory has approached this current problem from a biosynthetic perspective with a conjunction of optogenetics and engineering. We have inserted multiple pathways to induce and inhibit the production of our target flavonoids in E.coli. This will work by ligating the pathway genes with an inducible promoter that is activated by green light and repressed by red light in a matter of hours. The testing of the system is being performed in a bioreactor that follows industrial protocol and the extraction quantification will be tested by gas chromatography and High performance liquid chromatography.

NYU Shanghai

Location:	China	**Track:**	New Application
Region:	Asia	**Presentation:**	Friday - Room 304 - 5:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 162

C.O.D.E.S. - COllagen Derived Engineering Scaffold

Fish scales are actually capable of producing electric potential, and we believe that this feature is best utilized in a tissue scaffold. Fish scales are rigid and can uphold structure during tissue development, are piezoelectric and can initiate signaling interactions by electric potential with certain modulators, and are biocompatible as they are mainly made of collagen. In our iGEM experiments, we have proved two major points to show the feasibility of our idea: fish scales can produce electricity by mechanical stress; bacterial cells can be controlled by electric potentials to perform complex signaling pathways. Furthermore, we have applied feedback from experts to improve our own experiments and advance our ideas to the next step, such as creating a more complex tissue regeneration system.

OhioState

Location:	United States	**Track:**	Environment
Region:	North America	**Presentation:**	Sunday - Room 304 - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 205

Maizotroph: A Synthetic Diazotroph for Supplementing Maize Growth

The application of nitrogen fertilizers to agricultural crops often causes eutrophication of freshwater sources and environmental damage. Additionally, nitrogen fertilizers are currently produced using the Haber-Bosch process which is very energy intensive and uses large amounts of the world's natural gas supply. With a growing population, new methods are needed to improve agricultural sustainability and yields. Some plants form a natural symbiosis with bacteria that can take nitrogen from the atmosphere and provide it to the plant, in a process termed nitrogen fixation. Unfortunately, many agricultural crops lack symbiotic nitrogen fixing partners. A major crop lacking a bacterial partner is maize. We are attempting to take a natural colonizer of corn roots, Pseudomonas protogens, and introduce a 27 kb gene cluster from Rhodopseudomonas palustris that encodes the ability to fix nitrogen. If successful, this organism could reduce the need for industrially fixed nitrogen fertilizers.

Orleans

Location:	France	**Track:**	Environment
Region:	Europe	**Presentation:**	Friday - Room 309 - 11:30 AM
Section:	Overgrad	**Poster:**	Zone 1 - 34

The Metal'OSE Project (Optimized Sludge Engineering)

Our project aim to create a bacterium able to specifically remove heavy metals from sewage sludges and produce ethanol from the cellulose is contains. To do that, we modified the natural heavy metal resistance mechanisms from the bacterium Cupriavidus metallidurans strain CH34 to enhance or specify its heavy metal removal ability. Then, we provided it enzymes for alcoholic fermentation, to enable it to produce ethanol from glucose resulting from the prior enzymatic digestion of cellulose. The heavy metal resistance modification consists in an OFR deletion lead by homologous recombination. The alcoholic fermentation enzymes consists in a fusion protein created by a previous team placed under the control of the strong and heavy metal inducible 'Pan' promoter from Bacillus Subtilis and is provided to our Cupriavidus metallidurans CH34 chassis via a broad range host vector. The final modified strain is tested on sludge samples to demonstrate the application functionality.

OUC-China

Location:	China	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Saturday - Room 311 - 11:00 AM
Section:	Undergrad	**Poster:**	Zone 3 - 257

RiboLego：A Rational Approach to Engineer Modular and Tunable Riboswitch

Riboswitches can sense a wide range of small molecules and regulate gene expression. However, because of the diversity of downstream GOI, the structures of the riboswitch are often unstable. So riboswitch cannot be considered as modular components.This year, OUC-China aims to design modular riboswitch consisting of original riboswitch, stabilizer, and tuner from 5' to 3'. The stabilizer can stabilize the structure of the riboswitch. The tuner can reduce the expression probability of fusion protein and allow for predictable tuning. Then more tuners are designed to make diverse expression level. Finally, we use asRNA to change the on-off state of riboswitches.All in all, we create modular riboswitch and introduce asRNA so that gene expression in engineered systems can be more easily regulated. Depending on this design principle, we'll create more 'RiboLego'.

Oxford

Location:	United Kingdom	**Track**:	Therapeutics
Region:	Europe	**Presentation**:	Friday - Room 310 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 158

ProQuorum: Harnessing the power of probiotics and quorum sensing to treat C. difficile infection

Clostridioides difficile is the single most significant cause of hospital-acquired infections in the US with 500,000 infections per year, characterized by inflammation, diarrhea, bowel perforation and potential death. The predominant treatment for C. difficile infection is antibiotic prescription which disrupts the gut microbiome and exacerbates resistance concerns. Our solution is to engineer a Lactobacillus reuteri probiotic chassis to detect the quorum signaling autoinducing peptide of C. difficile in the intestinal lumen. Detection uses the C. difficile two component signaling system, to induce secretion of a C. difficile-specific endolysin to cleave its cell wall and leave the remaining intestinal flora intact. Monte Carlo simulations were performed to analyze the population dynamics of both species and refine our system within the spatial constraints of the human gut topology. Our design offers a targeted therapeutic for C. difficile infection, opening the possibility of a new modular system to treat gastrointestinal bacterial infection.

Pasteur Paris

Location:	France	**Track**:	Diagnostics
Region:	Europe	**Presentation**:	Saturday - Room 309 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 76

DIANE: An aptamer-based device for rapid detection of pathogenic bacteria in biological fluids

Rapid and precise diagnosis is critical to patient outcomes. Our goal is to develop a point-of-care diagnosis device, DIANE (Diagnosis is Now Easier), to be used for the detection of pathogens in biological fluids. The detection will take only a few minutes with a higher sensitivity than current serological cultures. Our device has been conceived to incorporate key design features based on feedback from physicians and scientists. It will be composed of aptamers linked to carbon nanotube electrodes, which will detect bacteria through a voltage change after binding. Aptamers are selectively identified from a library with the Whole-Cell SELEX method and chosen to recognize specific bacteria. Moreover, user-friendliness will be improved by automation with pumps and microfluidics. DIANE will enhance the diagnosis speed allowing doctors to adapt the treatment for each patient. We hope to make the diagnosis of critical life threatening situations quick and easy for practicians and NGOs.

Peking

Location:	China	**Track**:	Foundational Advance
Region:	Asia	**Presentation**:	Sunday - Room 304 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 198

Dr. Control: A dCas9-based DNA replication control system

Many challenges impeding genetically engineered bacteria from benefiting us can be attributed to the growth rate (e.g. infections in microbial therapies) and can be solved if we can better control over it. However, previous methods for growth rate control has many disadvantages: limited application scenarios, cell function disorders, etc. Here, we developed a novel system for precise growth rate control, by using dCas9 to target the DNA replication origin. Such system is highly tunable with multiple inputs, large dynamic range and non-detectable leakage. It functions in a gentle and reversible way without harming cell activities. Furthermore, we explored the potential of replication control in synthetic biology, including control of plasmid copy number and gene expression variation. Finally, we tried to design a safe therapeutic E. coli with high targeting specificity and controllable treatment intensity, promising to reduce the infection risk, which shows the broad application prospects of our system.

Penn

Location:	United States	**Track**:	Open
Region:	North America	**Presentation**:	Friday - Room Ballroom A - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 107

MIYAGI: An open-source wax printing conversion kit

Wax printing is used to fabricate microfluidic paper-based analytical devices (μPADs), which have emerged as promising platforms for developing low-cost diagnostic devices in resource-limited settings. Before such point-of-care devices can be made available for wide-spread use, foundational research is needed to build and test their efficacy. To make wax printing more accessible to educational and research laboratories, the Penn 2019 iGEM team designed, constructed, and validated an open-source wax printing conversion kit for widely used open-source Prusa 3D-printers. The device replaces the existing extruder with a custom-designed, heated, and pneumatically actuated wax extrusion system. G-code transformed from user CAD files (in the PrusaSlicer software) is then converted by a Python script into the necessary commands required by the MIYAGI device.

Pittsburgh

Location:	United States	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Sunday - Room 312 - 11:00 AM
Section:	Overgrad	**Poster**:	Zone 3 - 229

Design of Novel Protein-based Logic Gates using Split-Inteins

The design of protein-based cellular circuits offers the potential for rapid information processing. Previously, circuits were designed using kinases and proteases. Here, we propose two methods to design split-intein based cellular circuits. Upon association, split-inteins autosplice the flanking peptide sequences together to form functional proteins. Our first method involves the cascading splicing events through our nested intein design. This involves the insertion of an orthogonal split-intein within an intein half to render it nonfunctional. This creates a multi-input AND gate that can be incorporated into a larger cellular circuit. We propose a second method in which a weakly-associating intein is connected by aflexible linker. This linker is constructed from multi-input AND gates consisting of split-intein pairs, which avoids additional disruption of the extein sequence. We envision using our designed split-intein logic framework to create gene circuits capable of performing various Boolean logic operations through regulated splicing events.

Poitiers

Location:	France	**Track**:	Manufacturing
Region:	Europe	**Presentation**:	Sunday - Room 306 - 10:00 AM
Section:	Overgrad	**Poster**:	Zone 1 - 74

To Bee... Hornet to Bee

Have you ever wondered how important the natural pollination of plants is?Nowadays, a lot of edible plants and food producing plants rely heavily on the pollination, tying the diversity of our diet to the well-being of pollinating species. But these species, and specifically bees, are threatened by a new predator in France and Europe: Vespa velutina nigrithorax, better known as 'Asian hornet'.This predator slaughters European bees' population, and there is no efficient ways of fighting against it without compromising the environment.At 'To Bee... Hornet to Bee', we designed a new metabolic pathway, integrated in bacteria to produce specifically attractive molecules for the Asian hornet. These molecules could then be used in every kind of hornet traps, making them specific to the Asian hornet.

Potsdam

Location:	Germany	**Track:**	Software
Region:	Europe	**Presentation:**	Saturday - Room 310 - 11:00 AM
Section:	Overgrad	**Poster:**	Zone 1 - 6

TherMaL.UP - Evolution of thermophilic proteins with a neural network-based approach

Thermophilicity is a highly desirable protein property relevant for industrial and scientific applications. Predicting mutations needed to convey thermophilic qualities is very difficult which is why our project focuses on developing a neural network which models the thermostability of proteins and finds more heat resistant protein variants. We hope to reduce the amount of lab work necessary to create new proteins with different properties and thereby magnify the possible scope that directed evolution can offer.More concretely, we use existing data from databases like BacDive and train neural networks on around 7 million amino acid sequences to predict the optimal growth temperature of the host organism and then apply different methods to find more stable variants.In parallel to this, a directed evolution approach will be utilized in vitro to find thermophilic variants. Additionally, we will analyse and verify the proteins that the neural network has predicted in the lab.

PuiChing Macau

Location:	Macao	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room Ballroom A - 11:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 43

To Develop A Sustainable System For Endocrine Disrupting Chemicals Degradation

Our project aims at solving the Endocrine Disrupting Chemicals (EDCs) water pollution problem. EDC is a collection of chemicals that have long-lasting negative impact on human. EDC exposure is linked to diseases such as cancers and neurodegenerative disorders. Previous studies suggested that laccase can degrade various EDCs. In this project, we used engineered E.coli BL21 (DE3) to produce our selected Laccases. We cloned a collection of Laccases into E. coli, which include a stress-tolerant laccase. To develop a sustainable EDC degradation system, we also added a secretion signal peptide, NSP4 to the laccases expressed in E. coli. Moreover, we also built a green laccase production system. We transformed the laccases, with a PilA secretion signal peptide, into cyanobacteria (Synechococcus sp). In addition, we also designed a water filter that fits our engineered bacteria. All together, we believe that our project can help to find a solution for EDC water pollution.

Purdue

Location:	United States	**Track**:	Food and Nutrition
Region:	North America	**Presentation**:	Saturday - Room 306 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 1 - 77

RICE - Resistance Induced by Chitin Excretion

Every year, approximately 30 percent of rice crops across the world are damaged due to Magnaporthe oryzae, commonly known as rice blast fungus. While rice plants have receptors that sense chitin from fungal pathogens, M. oryzae secretes a chitinase to break down its own chitin before it is detected. Using this chitinase, M. oryzae is able to avoid triggering the rice's defense mechanism that would inhibit the spread of the fungal infection. However, by preemptively exposing the rice plant to chitin it is possible to trigger the rice's defense mechanisms before M. oryzae can suppress detection methods. In order to accomplish this, we worked to develop a method of exposing rice plants to chitin by introducing NodC, a chitin synthase homolog, into Pseudomonas fluorescens, a bacterium that naturally lives on rice leaves. By decreasing crop losses, our project can work towards increasing global food supply and bring agricultural innovation.

QDHS Shanghai

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Friday - Room 312 - 11:00 AM
Section:	High School	**Poster**:	HS Zone 2 - HS 48

Acetylcholinesterase (AChE) in pesticide detection

When farmers spray phosphate fertilizer on crops, the excess will leach to the underground, contaminating the water and resulting eutrophication which threatens many lives. Fertilizer pollution spreads globally, especially in developing countries where agriculture still holds economic dominance, although some countries have started to deal with the problem.We find that acetylcholinesterase is an enzyme which catalyzes the reaction converting P fertilizer to phosphoric acid. Therefore, we can use acetylcholinesterase to measure the concentration of Phosphate in water by detecting the level of PH. Our goal in this research is to produce acetylcholinesterase by bioengineering. We insert the ACHE gene in mouse into multi-clone vector pGEX-4T-1 with restrictive enzymes PluTI and BspQI, and then fuse it with E.coli. After expressing AChE, we assembly it into a PH device which corresponds P-fertilizer level with PH. In this way, people could learn the level of fertilizer pollution in water.

QHFZ-China

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Sunday - Room 302 - 11:00 AM
Section:	High School	**Poster**:	HS Zone 1 - HS 29

Uric Acid Explorer and Terminator

The incidence of hyperuricemia and gout have been increasing year by year. Many of the patients are suffering from pain, chronic kidney disease and other complications. Therefore, we hopes to build a bacterium that can detect the concentration of uric acid (UA), which is UA explorer, and a cell that can intelligently remove UA, keeping UA concentration at normal level, which is UA terminator. HucR is a transcriptional factor that senses UA. We combined HucR with the amplifier, Rinp80α, so that the bacteria could sense the stimulation of uric acid and send signals to us. We also identified the gene downstream HucR operon as uricase gene smUOX-Flag, which degraded uric acid at high a concentration. So far, our UA explorer can sense to UA, and our UA terminator can break down uric acid. In all, our work offers help for defending such diseases.

Queens Canada

Location:	Canada	**Track**:	Diagnostics
Region:	North America	**Presentation**:	Saturday - Room 309 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 181

Green Screen: Developing a Novel Biosensor for THC Detection

Rapid detection of tetrahydrocannabinol (THC) is becoming evermore important, as legalization ofmarijuana increases globally. An affordable one-step immunoassay has been developed for rapid detection of THC. This proof-of-concept assay uses fluorescently labelled recombinant antibodies for THC detection, and lipophilic membranes for THC absorption. The use of fluorescently labelled antibodies allows for low detection limits and high specificity when determining THC concentrations; hence, it has applications in roadside testing, as well as measuring output for industrial THC productions. Detection levels of 0.1 mg/mL were distinguished form the background; however, improvements to the lipophilic membrane could increase the sensitivity.

RDFZ-China

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 306 - 2:30 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 67

Fragrance Library

Fragrance generating parts are becoming more and more demanded in iGEM projects, as well as manufacture industries. While identifying that previous parts introduced by past teams were barely re-used, or integrated, thus we focus to build a library of fragrance-generating genes, in order to give better access with higher clarity, and reduce unnecessary time lost to those who may concern. The library will include about 30 coding sequences encode enzyme yielding fragrant substances from iGEM projects, constructed on vector psb4c5. Necessary information of parts will be added based on our own characterization results, as also 5 new parts will be included in the collection, for expression phenyethyl acetate, production route of Ehrlich pathway. Molecules are detected through GC/MS, to validate success of expression of each part. Also, we deem that cell free system can be used for educational purposes, as we apply our project on it for public engagement.

REC-CHENNAI

Location:	India	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Sunday - Room 312 - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 112

Deliveryt: Peptide-mediated Delivery of Macromolecular Cargo

Transfection is an established technique to transiently modulate gene expression in eukaryotic cells. Liposome-mediated transfection increases cellular endosomal turnover and stimulates carrier induced autophagy. Transfection efficiency of commercially available liposomal reagents is frequently associated with cellular toxicity in a dose-dependent manner. These complications, in addition to its high cost, augment the unmet need for a cost-effective and less-toxic transfection reagent. Cell-Penetrating Peptides (CPPs) are short (<30 amino acids) linear peptides that facilitate the cellular uptake of diverse macromolecules. The broad range of their cellular targets and their limited toxicity qualify them as ideal carriers for cargo delivery. Our current project involves the novel application of a synthetic CPP for the direct delivery of interfering RNA in the context of transient gene silencing. The selected CPP delivers the un-bound cargo through pore formation and gets selectively targeted for proteasomal degradation, thus averting the possibilities of carrier induced autophagy and cytotoxicity.

RHIT

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Friday - Room 210 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 126

Cobold Hunters: Bioremediation of cobalt and arsenic in contaminated soil and water

Heavy metals, such as arsenic and cobalt, are a continued concern in industrial facilities and agricultural areas. The goal of this project was to find a cost-effective, biological means of remediating these heavy metals to meet EPA standards. To this end, a two plasmid system has been implemented in BL21 (DE3) E. coli cells, involving metallothionein (MT) and superoxide dismutase (SOD) genes. Metallothioneins work to bind and effectively inactivate the heavy metals, while SOD genes have been implemented to decrease the sensitivity of the cells to the effects of heavy metal poisoning by reactive oxygen species, thereby extending the life cycle of the engineered bacteria.

Rice

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Friday - Room 313 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 3 - 268

Thermoplant: Automated design of RNA thermometers for controlling output of plant growth-promoting enzymes in rhizobacteria

Recent changes in climate patterns pose an enormous threat to the agricultural industry. Increasing temperatures and lower soil water content systematically decrease crop yields. This project aimed to tackle this problem from the bottom up by engineering a common soil bacterium, Pseudomonas putida, to overexpress plant growth-promoting enzymes under a temperature-dependent system. P. putida, with its known root interactions with Arabidopsis thaliana, was utilized to promote plant growth through the production of indole-3-acetic acid (IAA), 1-aminocyclopropane-1-carboxylate (ACC) deaminase, and trehalose synthase. A program that couples genetic algorithms and NUPACK was created to design and optimize low temperature RNA thermometers. These thermometers with melting temperatures around 30°Cinduced the translation of the enzymes to ensure optimal resource usage for the bacteria. Maximizing crop yields now will ensure better food availability and distribution in the future.

Richmond UR

Location:	United States	**Track:**	Environment
Region:	North America	**Presentation:**	Sunday - Room 304 - 11:00 AM
Section:	Undergrad	**Poster:**	Zone 2 - 132

Agro Immunity

The plant pathogen Agrobacterium tumefaciens (also known as Rhizobiumradiobacter) causes millions of dollars of crop damage yearly via crown gall tumors. However, a solution might be within Agrobacterium. We wanted to prevent tumorogenesis using a biomolecule, called curdlan, which is naturally produced by Agrobacterium and exists in the cell walls of plants as structural support. As a possible solution, we synthesized a plasmid that included the machinery to produce curdlan powered by a constitutive virulence promoter. This plasmid was inserted into a lab-grade strain of Agrobacterium that is faster at reaching wound sites then the wild type. When the synthetic Agrobacterium encounters a wounded plant, it will produce curdlan in large amounts. Thus, raising the plants structural defenses. The long-term goal is to utilize synthetic Agrobacterium like a factory to manufacture curdlan at a large scale for farmers, scientists, etc. to apply it.

RIS BKK

Location:	Thailand	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 210 - 3:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 31

Improving Lives Through Rice: Transmission of Nif genes from Azospirillum to Create Transgenic Rice

Thailand is an agriculture-based country. However, Thai farmers face economic hardships. The aim is to reduce the input cost by developing transgenic bacteria that will help plants fix nitrogen without the application of chemical fertilizers. We aim to synthesize Agrobacterium that is able to infect plants with inserted Nif genes from Azospirillum brasilense. By using Agrobacterium's ability to infect and transfer its DNA, we hope to allow plants to independently fix nitrogen. Nif genes were extracted from Azospirillum brasilense, transferred into E.coli as part of 2 vectors, pGem and pCambia, and put into Agrobacterium. Our design allows for the creation of a product such as biofertilizers or a gel-like-substance mixed with Agrobacterium which should increase the yield of crops. Although we were not able to transform our trangenic Agrobacterium into a product due to time constraints and other limitations we still hope that others will continue this in the future.

Rotterdam HR

Location:	Netherlands	**Track:**	Diagnostics
Region:	Europe	**Presentation:**	Saturday - Room 309 - 3:00 PM
Section:	Overgrad	**Poster:**	Zone 1 - 89

Health Risk Detection Kit (HRDK)

Imagine that you're so sick that you can't leave your bed. Or that you have anxiety for the doctor or even physical impairments are making it impossible to go to the doctor.You have to take a medical test in order to know what kind of disease your have. We got the solution!Our system works with aptamers that are specific to detect a certain target. The aptamers are bonded to zinc finger targets. The zincfingers are attached to the split TEV enzyme. When the aptamers detect a target, the whole system starts to come together. The two TEV (N and C TEV) will form one TEV enzyme and B-lactamase will become active after TEV has cleaved of the fused inhibitor. If B-lactamase is active, a color change from yellow to red will occur due to activity on the Nitrocefin compound. This means a positive result.

Ruperto Carola

Location:	Germany	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Saturday - Room 210 - 3:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 160

Fantastic yeasts and how to evolve them

Peptide detection plays a pivotal role in various synthetic biology applications ranging from point-of-care diagnostics to personalized medicine, and real-time profiling of biological systems and the environment. Naturally occurring systems for peptide detection commonly employ G-protein coupled receptors (GPCRs), linking extracellular cues to intracellular responses. For our project, we will harness the power of directed evolution coupled to the specificity of GPCRs, establishing a versatile platform for directed evolution of S. cerevisiae mating receptor STE2.We employ both in vivo and in silico, machine-learning-guided evolution for exploring the landscape of cognate receptor-ligand pairs. We provide a cell-level probabilistic model faithfully describing our system's dynamics. Furthermore, we extend the signalling repertoire of S. cerevisiae by engineering fully orthogonal GPCRs and signalling cascades. We combine these features to engineer a comprehensive yeast receptor and signalling evolution toolbox, which we provide to the iGEM community.

Saint Joseph

Location:	Turkey	**Track:**	High School
Region:	Europe	**Presentation:**	Friday - Room 306 - 5:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 41

LAKECASE

Laccase has been used for many projects over the years because of its wide range of substrate differing from lignin to other aromatic compounds. This feature makes this enzyme one of the most promising biological solutions for optimising the degradation of industrial waste. Our aim is to design a signal peptide for T. versicolor laccase enzyme and then integrate the gene that codes this signal peptide sequence in Escherichia coli. PelB will be the signal peptide that will direct the laccase enzyme to the periplasmic domain in the E. coli Shuffle strain, facilitating the formation of disulphide bonds, thus increasing its activity and stability. We also plan to use disulphate bonding isomerase (dbs) on other group to see if it is more effective than leading laccase to the periplasm. This way, we will overcome the yield problem that creates a bottleneck for industrial use.

Sao Carlos-Brazil

Location:	Brazil	**Track:**	New Application
Region:	Latin America	**Presentation:**	Saturday - Room 302 - 9:00 AM
Section:	Undergrad	**Poster:**	Zone 1 - 100

Astroshield: expanding the frontiers of life

Mars is a prime destination for humanity to settle down, but the planet is dominated by a high incidence of radiation. The establishment of a colony there requires overcoming several challenges, including the need for in situ food and energy production. To solve these problems, we have engineered a fermenting yeast able to amass melanin on its surface to become resistant to ultraviolet radiation using a yeast display consisting of the protein Aga2 and the peptide 4D, which has a high affinity for melanin, that provides protection against ultraviolet radiation, since melanin is known to absorb this kind of radiation. This technology could also improve fermenting processes on Earth, considering sugar-alcohol plants lose much of their yeast in bioreactors due to contamination. Therefore, the implementation of an ultraviolet sterilization process with a resistant yeast would be profitable to this industry. A glucose-based Kill Switch was developed for biosafety issues.

SASTRA Thanjavur

Location:	India	**Track:**	Diagnostics
Region:	Asia	**Presentation:**	Friday - Room 302 - 5:00 PM
Section:	Undergrad	**Poster:**	Zone 1 - 40

House of Toeholds: Biosensor for biomarker panel of differentially expressed circulating miRNAs in cervical cancer

Cervical cancer is the second most common cancer among Indian women with 500 million people at risk, and an unforgiving 50% mortality rate. Poor awareness and access to effective screening have caused enormous disease burden. We are developing a biosensor comprising nucleic-acid toehold switches designed to bind to certain identified differentially expressed circulating miRNA biomarkers of early-stage cervical cancer, namely miRNA-20a, miRNA-21, miRNA-29a and miRNA-200a. Each toehold switch is a second-generation design, requiring a biomarker-antimiR complex to release the expression of GFP, whose fluorescence intensity is measured. We are modelling and calibrating the performance of our toehold switches, and offering a web-server for the integrated design of these switches that uses multi-layer neural networks. Our parts characterization is performed cell-free. The developed switches may be embedded in a composite biosensor to yield a paper-based device for detecting cervical cancer.

SBS NY

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 312 - 5:00 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 45

Tackling heavy metal pollution by the expression of MerR-like receptors and CapB in E.coli

Monitoring and eliminating heavy metal pollution are critical to our environment. The existing solutions, which usually require bringing soil samples into a lab, are costly and ineffective. Our team implemented multiple MerR-like regulators to drive the expression of the reporter genes and monitor the concentration of several heavy metal cations. Through mathematical modeling, we used an algorithm to take the effect of all ions -- conjugate and non-conjugate -- into count, giving a reliable readout to multiple types of co-existing heavy metal ions and avoiding errors caused by the cross-talk of non-conjugate metal inducers during the quantitative analysis. In addition, we found out that the absorption of heavy metal cadmium by CapB gene enables the removal of cadmium once it is detected. Combining the metal detecting MerR-like regulators and cadmium absorbing CapB, we have devised a prototype to reduce cadmium concentration in soil and address related agricultural and environmental issues.

SCU-China

Location:	China	**Track:**	Manufacturing
Region:	Asia	**Presentation:**	Saturday - Room 311 - 5:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 173

COReguLaTINO: The Co-fermentation of Cordycepin and Pentostatin

As one of the precious Chinese medicine, cordyceps militaris has been used for hundreds of years for health care and disease treatment. Cordycepin, one of cordyceps militaris' components, has been proved of great clinical potentiality. But its price is too high to afford at approximately 1500 dollars per gram. So, 2019 SCU-China wants to decrease the price of cordycepin by using engineered yeast for factories. We add the delayed expression system to automatically ferment cordycepin and its protector, pentostatin. As a result, we can produce cordycepin in a cheaper and more automatic way.

SCUT China

Location:	China	**Track:**	New Application
Region:	Asia	**Presentation:**	Sunday - Room 311 - 3:00 PM
Section:	Overgrad	**Poster:**	Zone 1 - 50

VerProS: A versatile Promoter-Toehold Switches pool for optimizing adaptability of multi-gene system in E. coli

Precise and reliable gene expression is critical in fine regulation of gene or pathway expression. Routinely, it always requires library construction to each genetic part, which is costly and time-consuming. Our project has developed a method to optimize the adaptability of multi-gene system in E. coli, with only one library so-called Promoter-Toehold Switches pool. A pool is built where four Toehold Switches are placed under one of 10 promoters that yielding about 10^4 combinations. This pool can simultaneously optimize up to four genes in a system. Particularly, this versatile library can be applied to fast optimization in different systems without having to build ad hoc libraries, which can greatly reduce manpower and costs. Here, we demonstrate the versatility of this approach by using the pool for fine regulation of four genes to enhance the acid tolerant of E. coli.

SDSZ China

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Saturday - Room 306 - 5:00 PM
Section:	High School	**Poster**:	HS Zone 1 - HS 15

Luci-phage detection system of fecal water pollution

As one of the most common pollutants of fecal-polluted water, somatic coliphage is widely used in various protocols as the indicator of fecal and viral pollution. Our team designed a biosynthetic system that effectively detects bacteriophages in fecal polluted samples by inserting sequences of firefly luciferase and polyphenol oxidase in pET 28a and pET 30a vectors. After adding appropriate substrates to LB medium, enzymatic reactions occur when cell lysis takes place due to phage attack, and expressed enzymes leak from lysed cells to interact with their according substrates. Fluoresce and observable color change of the enzymatic reactions will then be tested and recorded for identification of the sample's phage density, and thus the tested sample's degree of pollution can be indicated.To avoid false negative responses, our team further inserted sequences downstream to express 2-Phenylethanol, emitting scent which acts as expression indicator that will not hinder luminescence detection.

SDU CHINA

Location:	China	**Track**:	Foundational Advance
Region:	Asia	**Presentation**:	Friday - Room 311 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 3 - 222

Light-controlled bacterial co-culture system

In nature, the microorganisms don't exist in isolation, but interact and cooperate to accomplish the complex tasks in the complicated ecosystem. In the microbiological industry like fermentation, the bacteria co-culture is promising. However, it is difficult for people to achieve dynamic regulation in the co-culture system. This year, we build a LCBC system (Light Controlled Bacteria Co-culture). In the system, we use the lights with different colors to regulate and control the amount and ratio of the bacteria. This system consists of three parts: two orthogonal light-controlled systems, the QS system which is designed for bi-directional communication, and the toxin/antitoxin system that can regulate the amount and ratio of the bacteria. We also develop the matching software to help the users apply our system. In the future, we envision our bacteria co-culture system being applied in the fermentation and other related microbial engineering.

SDU-Denmark

Location:	Denmark	**Track**:	Therapeutics
Region:	Europe	**Presentation**:	Friday - Room 302 - 12:00 PM
Section:	Overgrad	**Poster**:	Zone 3 - 250

Conjugaid: Sensitizing Bacteria to Antibiotics by Bacterial Delivery of CRISPR/Cas

In 2050, the number of deaths caused by infections with antibiotic-resistant bacteria is predicted to exceed that of cancer (O'Neill, 2014). Existing therapeutic strategies cannot keep pace with the rapid progression of antibiotic resistance. To combat this challenge, innovative approaches must be developed.In collaboration with our local hospital, we have designed a plasmid-based CRISPR/Cas-system targeting antibiotic resistance in pathogenic strains of E. coli. This system is delivered using an E. coli vehicle, which transfers the plasmid to the target in the gastrointestinal tract by bacterial conjugation. Thus, our system can be used to sensitize pathogens to antibiotics.We believe that antibiotic resistance cannot be resolved by scientific solutions alone. Therefore, we aim to provide future generations with tools to creatively solve this global challenge. For this purpose, we have collaborated with students and teachers to develop a 5E model-based teaching material to supplement the Danish high school curriculum.

SEFLS Shanghai

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Friday - Room Ballroom A - 12:00 PM
Section:	High School	**Poster**:	HS Zone 1 - HS 25

Construction and application of the squalene microbial factory: redemption of sharks

Squalene, a universal precursor of various bioactive compounds, has unique physical and chemical properties, making it beneficial to human. Sharks' liver oil is the richest natural origin of squalene. However, this origin is limited because of epidemic marine pollution, overfishing of sharks and the international concern on shark protection.The goal of this research is to produce squalene using E.coli, the most common microbial factory. To achieve this, we need to introduce exogenous squalene synthase (SQS) into E.coli.Firstly, we compared the yield using SQSs from different species. To facilitate this, CrtN, turning colorless squalene into yellow ß-carotene, is introduced. Secondly, an exogenous MVA pathway is introduced and a more effective MEP pathway is developed via overexpression of key regulatory enzymes. Both pathways produce the precursor of squalene in E.coli and eventually improve the squalene yield.This research provides an alternative to squalene production, bringing positive effects on shark protection.

SEU

Location:	China	**Track:**	Open
Region:	Asia	**Presentation:**	Saturday - Room Ballroom A - 2:30 PM
Section:	Undergrad	**Poster:**	Zone 1 - 48

Synthesizing Neurons in Artificial Neural Networks with DNA reactions

Artificial intelligence has become a hot topic for years, as it has the potential to provide a general tool for solving different problems. However, the area complexity and power cost of traditional silicon-based circuits implementation of artificial neural networks have somehow limited its application. To implement artificial neural networks more efficiently, DNA computing provides an alternative to silicon-based circuits, due to its high computation parallelism and low energy cost. In this project, we propose and demonstrate molecular computation models for basic arithmetic operations in artificial neural networks, based on which we synthesize basic neural networks with DNA reactions. We developed a webpage tool that generates DNA reactions and relevant DNA sequences according to the required parameters of neural networks. Therefore, users can use this tool to obtain expected DNA-based artificial neural networks, which may help them with further molecular computer design and bio-robot design.

SEU-Nanjing-China

Location:	China	**Track:**	Environment
Region:	Asia	**Presentation:**	Sunday - Room 313 - 3:00 PM
Section:	Undergrad	**Poster:**	Zone 1 - 105

Algae Terminator

Under the background of global warming and ocean acidification, large scale of Cyanobacteria bloom forming is unavoidable and become a serious global environment problem.Recently, we have found that the unique intracellular digestion mechanism of the Branchiostoma can degrade algae into nutrients such as amino acids and polysaccharides with effectively degradation of harmful substances such as algal toxins. This discovery provides a new perspective and insipration for exploring algae resources.Methods of bioinformatics are applied to further analyze the proteome of Branchiostoma and to screen specific proteins. We will transduct the screened genes into E-coli and design an efficient expression pathway to realize scale processing of algae mud. Gradient experiments will be conducted to explore the optimum reaction ratio and reaction conditions. Furthermore, we will explore its possibility to turn into raw material for animal feed to help fight global hunger.Use earth wisdom, solve earth problem. We are moving!

Shanghai City

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 313 - 5:00 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 40

GEEnager: Gene Engineering and Encryption team

Common paper-based text or electronic information may be intercepted and cracked, and the information security for commercial interests, national security is critical. Life information has been stored in DNA for billions of years, and it can also be used as storing and communicating information. The method of CRISPR Cas12a-Assisted DNA Steganography (CADS) is based on the specific capture of binding primers of Cas12a, which enables the correct information of DNA to be stored in junk and false DNA information, and further enhances the security of key. Here, we encrypt the information storing in DNA combined with computer science, and we further increase the security of DNA information communication based on CADS. Additionally, DNA information is stored in paper. DNA has a very high density of information per unit mass, and as the price drops and the speed of DNA reading and writing speeds up, this method has important application value.

Shanghai High School

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 312 - 12:00 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 26

Dr. Thermometer: RNA thermometer for temperature indicator with color display

The vaccine ‘cold chain’ is to maintain product quality from the time of manufacture until the point of use. How to ensure temperature never rised during the storage and transport in a precise and convenience way is critical. RNA thermometers, which are RNA-based sensors, control the gene expression by achieving certain temperature. Here, we construct a library of RNA thermometers, based on thermodynamic computations, to express chromoproteins or fluorescent proteins in cell-free system. Our results show that the RNA thermometer system reacts with visible colors by the temperature rises in a short time. Our results also demonstrate that this system has high capability of detecting temperatures in small amounts of changing. We design and try to make a commercial, cheap and simple product to put on vaccine package. We anticipate our assay is a starting point of detecting temperature and could be applied to other fields, for example, food.

Shanghai HS

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Friday - Room 306 - 5:00 PM
Section:	High School	**Poster**:	HS Zone 1 - HS 27

Cyanobarrier: Solve the harm caused by cyanobacteria

Every summer, the outbreak of cyanobacteria puzzles numerous countries in the world. It causes insufficiency of oxygen in the waters, and the release of a poisonous substance called microcystin, which, even in small amount, causes serious diseases like liver cancer. However, the current method of removing microcystin is still inefficient or produces secondary pollution. Here we utilize enzyme MlrA, which is able to degrade microcystin, to solve the pollution. The mlrA genes from several different speices are expressed in E. coli and purified. The results show the microcystin is degraded with mlrA by HPLC (High Performed Liquid Chromatography). Furthermore, we try to design a device which is commercially mass produced and can be utilized by the waterworks or even at home. We anticipate our solution to aid in protecting the environment and avoiding people from getting sick because of drinking contaminated water.

Shanghai HS United

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Sunday - Room 210 - 2:30 PM
Section:	High School	**Poster**:	HS Zone 2 - HS 53

ASFVRD: African Swine Fever virus rapid detection

African Swine Fever virus, ASFv, is a double-stranded DNA virus fatal to pigs. ASFv reached China in 2018 and epidemic was reported on August 2nd. When infected by ASFv, symptoms such as diarrhea are identified on pigs; to prevent dissemination, effective detection is momentous as the infected population must be quarantined. However, the current method in China is inefficient while the virus could spread and cause immeasurable economic loss in pork-consuming countries. Shanghai HS United iGEM team shows an innovative method to detect ASFv among the pigs by test strips with FITC probes to determine the result's positivity. Our results demonstrate loop-mediated isothermal amplification (LAMP) and Cas12a reaction together shorten the detection and satisfies our three aims □ simplicity, immediacy, and accuracy. We believe our method is practical and operational by the pig owners and is cheaper and more effective than PCR, so treatments can be instantly implemented.

Shanghai YGQ

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 306 - 4:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 16

No title

No abstract

Shanghai-United

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 304 - 9:30 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 57

The characterization protein and early diagnosis of cervical cancer

All women are at risk of cervical cancer which has become a leading cause of women's death. Although precancerous treatment can markedly lower mortality rates, they are still high worldwide due to limited access to cervical cancer screening. Here we demonstrate specific protein expression variations related to NFX1 over-expression, a gene found to be closely associated with cervical cancer. Hela cells were either injected with empty vectors, or plasmids containing NFX1 and GFP genes. After they fully expressed inserted genes, we ran Western Blot, IP MS, and FASP to determine and confirm the differential proteins. After careful analysis, the statistical outcomes of IP and FASP Mass Spectrum combined, indicated significant changes in the expression of 280 proteins caused by NFX1 overexpression. Our findings can serve as a convenient biomarker to identify people carrying over-expressed NFX1, signal high risk of cervical cancer, and prevent cervical cancer in early stages.

ShanghaiFLS China

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 312 - 11:30 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 71

The Optimization of the Metabolic Pathways of P.pastoris in Medicine Production via Methanol Fermentation

Greenhouse gases can be converted into single carbon compounds, and engineered Pichia pastoris, a type of methylotrophic yeast, is capable of converting methanol into medical compounds such as insulin and lovastatin. However, in such P. pastoris, the metabolism of methanol is highly specific and results in significant oxygen consumption and heat generation, which have limited its industrial applications.We aim to address this issue by maximizing the methanol conversion rate in P. pastoris by re-engineering its homogenous circuits expressing the transcription factors that would up-regulate the expression of AOX1, the protein allowing it to metabolize methanol.Our preliminary results have demonstrated that one of our constructs does achieve an up to 41% increase in the expression level of the reporter gene GFP. We also validated our design by building a mathematic simulation of an industrial setting. Further results and data are on our wiki page, please check it out! https://2019.igem.org/Team:ShanghaiFLS_China

ShanghaiTech China

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Saturday - Room 313 - 3:00 PM
Section:	Undergrad	**Poster:**	Zone 1 - 69

INSULEN: An Intelligent N-palmitoyl-serinol System Utilizing Light-controlled Enterobacterium for diabetic therapy.

Type 2 diabetes (T2D) has become an increasing public health problem worldwide. Its existing treatments, including insulin/GLP-1 injections and other drugs, are inconvenient and expensive. N-acyl amides are a family of small molecules secreted by resident enterobacteria to relieve T2D. Thus, ShanghaiTech_China team aims to engineer a smart enterobacteria system that can be fed in glucose values to control the production of N-acyl amides for diabetic alleviation. Using E. coli as a demo, we cloned the synthase for N-palmitoyl serinol, the most potent group in N-acyl amides, into the E. coli expressing plasmid under a light-controllable promoter. Then, we designed a software and LED device that can accept glucose signals from T2D patients to control the synthase expression, which leads to the production of the therapeutic molecule. Together, with INSULEN, we offered a convenient, cheap and smart way to battle against T2D and proved it in principle.

Sheffield

Location:	United Kingdom	**Track:**	Open
Region:	Europe	**Presentation:**	Saturday - Room Ballroom A - 3:00 PM
Section:	Undergrad	**Poster:**	Zone 1 - 22

OPENLUX

Biology is so expensive that it's always easier to read about, but hard to get any practical experience on. By making scientific equipment more affordable and smaller, we believe we can make it more widely accessible, and enable more people to get that experience. OPENLUX is an affordable, Do-It-Yourself, open source microplate reader that aims to not only decrease the purchase price by at least 10-fold, but also to empower the user by being customisable. This allows for a mix & match of features, as well as self-service.

Shenzhen SFLS

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 312 - 11:00 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 63

Armour from the sea: A Microbial Manufacturing Band-aid Made of Mgfp-5 and Masp-1

Mussel Foot proteins, a strong adhesive, water insoluble and flexible protein which is nontoxic and do not impose immunogenicity to the human body, can be used as medical adhesives. Our project focuses on building adhesives with a celebrated protein: mussel foot protein, and make it into a Band-Aid that can seal the wound quickly. In order to achieve those aim, two properties, adhesion and cohesion, become crucial. The MFP is proven by many scientists to have a strong adhesive power. But for achieving cohesive, we elaborate the MFP by fusing natural spider silk protein Masp1 into it. The Masp1 protein, flexible but also adhesive, with its cohesion and strength, will further assist our product in wound sealing. By fusing them, we get the MFP-Masp1 protein and by bio-manufacturing this protein using E. coli. We consider that this could ultimately develop into a new material in daily medications.

SHSBNU China

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 310 - 5:30 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 64

PROBE □□ Plasmid Recorder of Biological Events

DNA is a biological macro-molecule which can carry huge amount of information accurately, and this feature can be used to achieve data recordings in vivo. Our project aims to build a biological recorder that can monitor extracellular information and record it on DNA. Recombinase or CRISPR base-editor is used to target specific DNA addresses and generate mutations in a reporter gene, so the recordings can be quantitatively measured to infer intensity and duration information about the chemicals of disease, such as inflammatory bowel disease. Additionally, we designed a hardware for in situ biomolecular detection to monitor gastrointestinal health. This platform could enable more precise detection and could help improve the management and diagnosis of gastrointestinal disease.

SHSSIP-CHINA

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 309 - 2:30 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 73

No title

Our team aims to make healthier and more powerful Probiotic yogurt. We are going to characterize the trehalose synthase (TSase) in the Bifidobacterium □which is widely used in the yogurt and the Lactic acid bacteria drink. TSaes can convert maltose into the trehalose inside the Bifidobacterium , and the trehalose can protect the bifidobacterium by enhancing its resistance to the freezing and dryness during the freeze dried process while fermentation. Furthermore, the inside trehalose can also extend the guarantee period and improve positive effects of the Probiotic drinks by enhancing the vitality of probiotcs.

SIS Korea

Location:	Korea	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 302 - 2:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 24

Development of PET Degradation Device Using Transgenic Escherichia Coli

In the past 65 years (1950 to 2015) only 7% of the 83 billion tons of plastic have been recycled, and 50% has been dumped into the environment. The effort of reducing plastic in the environment is being made by various fields, however due to the high cost of plastic treatment and its harmful side products a breakthrough is yet to be made. In this project we have established an improved PET degradation system. First, we utilized point mutations with enhanced PET degradation, and implemented a light inducible promoter to regulate the expression of PET-degrading enzymes more effectively. To increase the efficiency of the enzyme expression, we determined the best combination of some constitutive promoters and RBS. Not only that, we used a new signal peptideto increase the amount of secreted enzymes. From these results, we constructed a circulating incubator in which PET is degraded by transgenic E. coli.

SJTU-BioX-Shanghai

Location:	China	**Track:**	New Application
Region:	Asia	**Presentation:**	Saturday - Room 302 - 9:30 AM
Section:	Undergrad	**Poster:**	Zone 1 - 10

Mulan - a real-time off-target detection and biostorage device based on CRISPR

As a significant tool in biological research, CRISPR's potential has not been fully exploited, and the off-target problems remain unsolved. Concerning this, we aim at optimizing CRISPR system in two aspects: developing in-situ detection of off-target and novel biostorage.The real-time monitor of off-target is basically composed of a lure sequence, derived from off-target possibility predictions with the Markov model, and a quick-response reporter system based on split luciferase. Luminescence is displayed upon dCas9's binding to lure sequence using luciferase complementary assay. Our biostorage is based on CRISPR acquisition. Signal initiates Cas1/2 to insert protospacer into CRISPR array, further moving the predesigned stop codon out of frame and EGFP into the ORF. When applied with Galois fields, information can be stored in binary format with optimal fault tolerance. In summary, our project provides an off-target control and a novel application for CRISPR.

SJTU-software

Location:	China	**Track**:	Software
Region:	Asia	**Presentation**:	Sunday - Room 312 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 211

Phosyme: an online database with toolbox focusing on the plant synthetic biology

With the rapid development of plant synthetic biology, an integrated platformis in a great demand to combine data analysis algorithms/methods and databases like KEGG and Plantcyc. We present here Phosyme, an online toolbox focusing on the plant synthetic biology. Phosyme provides an integrated metabolism database for plant synthetic biology as well as tools including enzyme selection system and reaction prediction systems.In addition, Phosyme integrates existing plant synthetic biology results in iGEM. Deep learning will be applied to predict the reaction between an enzyme and the base.The enzyme selection tool can help users determine whether an enzyme can react to a base in photosynthetic reactions.

SMMU-China

Location:	China	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Sunday - Room 306 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 168

Wukong: an Engineered Theranostics based on Synthetic Immune Cells

Expressing chimeric antigen receptors (CARs) on immune cells is an emerging and promising treatment strategy for cancer, however, cancer heterogeneity derived antigen modulation may limit its implementation in solid tumors. Moreover, presently it is hard to evaluate and trace the therapeutic role of Synthetic Immune Cells. Here, we designed and characterized a novel Engineered Theranostics with the core device in which the CAR-immune cells were reprogramed to co-evolve with tumor-antigens and to send secondary signals to trigger custom-designed external devices. Two kinds of external devices, a Peripheral Probe for tracing the activity of CAR-immune cells and an Antibody Pump for enhancing Immune cell killing efficacy were further developed. The whole system is named after Wukong (Monkey King) of the ‘Journey to the West’.

SNU India

Location:	India	**Track**:	Environment
Region:	Asia	**Presentation**:	Saturday - Room 302 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 231

AlBaCo: An Algal-Bacterial Consortium for Detection and Degradation of Endocrine disruptors

This project aims to develop tools for bioremediation of estrogenic pollutants by utilizing an algal-bacterial consortium. The project involves expression of laccase enzymes to degrade these phenolic pollutants, and enhance this process in presence of a mediator compound which is produced by metabolically engineered bacteria. The system also can be used to quantify the concentration of estrogen by combining the laccase-mediator system with an engineered bio-sensor which induces expression of a reporter gene in presence of estrogen. In addition to targeting endocrine disruptors, Algae also provide a wastewater treatment solution, lowering Biological and chemical oxygen demand, and removing excess nutrients like phosphate and nitrate sources from the water. The project utilises computational modelling and simulations to predict the degradation of target compounds, and quantify estrogen concentration. In addition to computational modelling, the project also involves in-vitro chemical analysis, and the assembly of the biological constructs by cloning and their characterization.

Sorbonne U Paris

Location:	France	**Track**:	Environment
Region:	Europe	**Presentation**:	Friday - Room Ballroom A - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 193

The Bi[oil]ogical Factory

Palm oil is the most widely used vegetable oil, with over 60 billion tons per year. However, its mass production has destructive consequences for the environment.Therefore, we want to demonstrate an alternative and ecological way of producing oil by developing a new chassis for the production of lipid compounds in a photosynthetic green microalga named Chlamydomonas reinhardtii. We want to build our proof-of-concept by modifying this microorganism to produce palmitic acid (C16:0) and oleic acid (C18:1), which are the main components of palm oil.To this end, we will express enzymes from the african oil palm Elaeis guineensis in C. reinhardtii using the Golden Gate Modular Cloning (MoClo) technology.Moreover, we will implement the HiBiT technology created by Promega in the MoClo kit by standardizing and integrating it into the C. reinhardtii MoClo kit in order to allow for a quick and effective measurement of our enzymes expression.

SoundBio

Location:	United States	**Track**:	High School
Region:	North America	**Presentation**:	Friday - Room 309 - 3:30 PM
Section:	High School	**Poster**:	HS Zone 2 - HS 47

Bacto-Basics: Spatially Controlling attachment of Functional Proteins on Bacterial Cellulose using Optogenetics

Our project aims to create a platform for precise, light-based control of bacterial cellulose (BC) functionalization for a multitude of applications including burn wound treatment, tissue scaffolding, and air filtration. We will grow Komagataeibacter rhaeticus (K. rhaeticus), a bacterial species that naturally produces BC. We will engineer E. coli to attach fusion proteins via a double cellulose binding domain for functionalization of BC. Levels of functionalization will be controlled with focused light via two optogenetic circuits utilizing red and blue light. By designing and constructing a bioreactor compatible with our optogenetic light control system, we aim to optimize K. rhaeticus growth and BC production by using Raspberry Pi-controlled sensors to monitor our culture's pH, oxygen levels and temperature and developing a method to optimize media conditions. Our project demonstrates a proof-of-concept regarding BC functionalization through the attachment of chromoproteins to the cellulose membrane.

Sriwijaya

Location:	Indonesia	**Track**:	Diagnostics
Region:	Asia	**Presentation**:	Friday - Room 210 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 110

CEAgar: A Reliable, Practical, and Affordable Lung Cancer Diagnostic Tool

Lung cancer is a condition where cells grow uncontrollably inside the lungs. In 2018, new cases of lung cancer account for 30.023 cases and the numbers are estimated to go up each year. Based on that fact, an effective, rapid, and accurate diagnostic method is needed to change the patient recovery rate in treating lung cancer. The gold standard of diagnosing lung cancer right now is histopathological examination with the specimen is obtained by biopsy. Nevertheless, biopsy has lots of disadvantages such as misdiagnosis and invasive. The writers proposed a non-invasive serological diagnostic tool, CEAgar. The purpose of this project is to create a CEA detecting diagnostic tool through genetically engineered plasmid with Escherichia coli as the vector which can express transforming growth factor-beta receptor type 1 (TGFRBR1), a natural CEA receptor found in human body.

St Andrews

Location:	United Kingdom	**Track**:	Foundational Advance
Region:	Europe	**Presentation**:	Friday - Room 312 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 26

Stabilising Antibody Domains using Intramolecular Isopeptide Bonding

Intramolecular isopeptide bonds are crosslinks found in the surface proteins of gram-positive bacteria, which confer significant structural, thermal, and proteolytic stability to the parent protein. By combining machine learning and rational design approaches, we sought to adapt this crosslinking to stabilise the antibody CH3 domain, with a view to creating long-lasting Immunotherapeutics. We also undertook a search of known protein structures to identify suitable candidate proteins for stabilisation via isopeptide bonding, and present this list for future work.

Stanford

Location:	United States	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Saturday - Room Ballroom A - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 217

Rolling the DiCE for the directed evolution of biological parts

The current paradigm of part creation, characterization, and documentation is extremely rate-limiting for scientific discovery. The 2019 Stanford iGEM team envisions an alternative model for facile part creation where final genetic device performance necessarily conforms to initial design specifications. To make this future a reality, we focused on developing self-selecting systems (SSS): directed evolution platforms that selectively amplify the genotypes corresponding to desirable phenotypes. Specifically, we developed Directed Chassis-agnostic Evolution, or DiCE, a novel, easy-to-implement selection-based directed evolution platform built off Qbeta replicase, an RNA-based RNA polymerase, capable of evolving proteins in vivo and in vitro. Furthermore, we generated standard selection schema compatible with PREDCEL (Heidelberg 2017) to expand the range of synthetic biological parts that can be created by any SSS. Taken together, our work on SSS presents a foundational advance towards a future where part creation is easier, faster, and more accessible.

Stockholm

Location:	Sweden	**Track**:	Therapeutics
Region:	Europe	**Presentation**:	Sunday - Room 310 - 2:30 PM
Section:	Overgrad	**Poster**:	Zone 1 - 33

Esther: the new tool for improved phage therapy

Phage therapy has gained much attention over the last years, utilizing the natural capability of bacteriophages to eradicate harmful pathogens. Nonetheless, it is still far from being available to the general public; mostly due an inconsistent delivery efficiency. Our aim is to provide a new method to deliver temperate phages □ this is, phages that have both a lysogenic and a lytic cycle. Harmless bacteria are used as vehicle for phages, which will remain integrated in the bacterial DNA through the lysogenic cycle. Using our genetically modified switch, the lytic cycle is triggered once the vehicle has reached the site of infection, releasing a high dose of localized bacteriophages, ready to infect pathogenic bacteria. Named after the famous microbiologist that discovered the lambda phage, Esther Ledeberg, and as a tribute to all women in science, we have named this new tool for improved phage therapy Esther.

Stony Brook

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Saturday - Room 312 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 1 - 91

Potential prevention of TMV mottling and necrosis via yeast XRN1 gene expression in plants

Despite being coined the Tobacco Mosaic Virus, TMV is known to infect over 350 different species of plants around the globe, threatening crop yields for dependant farmers.Because the virus is spread between plants via pollinators such as bees, the preventative solution has been to use pesticides to avoid interaction between the bees and the affected crops.To alleviate the spread of TMV while simultaneously preserving environmental safety, we looked into expressing the yeast gene, XRN1 in plants.By producing the protein XRN1-p, yeast has a means of breaking down non-local and invasive RNA, a system that the eukaryotic N. Benthamiana does not have.Ultimately, by expressing the yeast gene in our tobacco plants, we hope to both test whether it would successfully breakdown the viral RNA while also exploring whether yeast gene expression in plants is viable.

Strasbourg

Location:	France	**Track**:	Food and Nutrition
Region:	Europe	**Presentation**:	Saturday - Room 306 - 10:00 AM
Section:	Overgrad	**Poster**:	Zone 3 - 269

AptaTest : Hunting Allergens !

The prevalence of food allergies is currently increasing to reach 10% worldwide. Food allergy and intolerance can become a burden in the daily life of people. This is strengthened by the evolution of food habits. New products on the market, transformation processes and the eating tendency of the population (fast foods, canteens, ready meals) contribute to the emergence of new allergens. Many new allergic reactions are due to ingredients which are not labeled correctly. We aim to facilitate the life of people who suffers from food allergies by offering a food allergen detection kit with colored signal system. It should be fast and portable for easy on-site use, as well as versatile to adapt to any allergen. It is based on a triple hybrid system implemented in E. coli. Flexibility will be provided thanks to an aptazyme which will be interchanged for specific allergens.

Stuttgart

Location:	Germany	**Track**:	Foundational Advance
Region:	Europe	**Presentation**:	Saturday - Room Ballroom A - 9:30 AM
Section:	Overgrad	**Poster**:	Zone 1 - 31

PhyCoVi Phycotrophic Codonoptimized Vibrio

Public interest in sustainable and eco-friendly processes is as high as never before. Given the growing scientific and industrial interest in Vibrio natriegens, we aim to establish V. natriegens as an alternative protein production organism to E. coli while also creating a sustainable, eco-friendly substrate based on microalgae. Our in-silico simulations revealed tRNA availability as a bottleneck in mRNA translation. Our goal was to enhance the applicability of V. natriegens by improving protein expression through increased tRNA availability. To establish a change towards sustainable cultivation of microorganisms, we used CO2 fixing phototrophic microalgae as a base for a climate-friendly substrate. In order to produce an algae-substrate, we cultivated Chlorella vulgaris and Chlorella sorokiniana in a self-built bioreactor. The produced biomass was disrupted, the nutrients were analyzed qualitatively and quantitatively and used for cultivation. Using optimized V. natriegens coupled with our climate-friendly substrate we aim to shape the future of biotechnology.

SUIS Shanghai

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 302 - 12:00 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 21

K.O.I □ Koi herpes virus Oral Immunotherapy

Koi fish (Cyprinus rubrofuscus) are familiar ornamental fish synonymous with Asian culture and possessing huge decorative appeal globally for their many aesthetically pleasing varieties. Similar to other high-density fish farming and breeding operations, these picturesque fish have increased exposure to infectious disease. One particularly disruptive disease is Koi herpes virus disease (KHVD) caused by the highly pathogenic Koi Herpes Virus (KHV) also called cyprinid herpes virus-3. Mass mortality in Koi results from infection. Our project aims to develop an easy to administer vaccine against this virus.Our plan is to engineer live bacterial vaccines that will be administered to fish through the oral route. We will develop and engineer systems that allow bacteria to produce antigens only upon arrival in the iron-deficient environment of the fish gut. While we will also design a system to allow bacteria to present the antigen on the cell surface to illicit the immune response.

SUSTech Shenzhen

Location:	China	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Saturday - Room 309 - 9:00 AM
Section:	Undergrad	**Poster:**	Zone 2 - 202

C-hoop

Accurate manipulation of mammalian cells' behavior remains challenging, because mammalian cell processes a complex multi-level network of gene expression regulation and protein transportation. To better understand this network and actualize precise manipulation, we raised three essentials as a 'controlling hoop' on the mammalian cells. First is to effectively switch the input and to visualize the output of the whole regulation network, thus we transfected into HeLa cell a light-switchable transcriptional factor 'LightOn' (2012, X.Wang et al) to control cytokine gene expression (input) in and we applied a microfluidics chip to directly observe the cell migration triggered by the cytokine expression (output). Second is to prevent the cell-cell variation during the experiment, hence we designed a automatic illumination and sample collection system to standardize the various factors in experimental conditions. Third, we calibrated mathematical models from experimental data to design input sequences for achieving desired dynamic range of protein expression.

Sydney Australia

Location:	Australia	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Friday - Room 313 - 3:00 PM
Section:	Overgrad	**Poster**:	Zone 2 - 115

Magi.Coli: Taking the Magic from Mushroom to Microbe

One in four people will experience an episode of mental illness at some point in their life, and the required support services make up a significant portion of healthcare expenditure worldwide. Psilocybin, found naturally in 'magic mushrooms' (Psilocybe spp.), has shown great promise in clinical trials for the treatment of mental illnesses including treatment resistant depression and end of life anxiety. At present, psilocybin is produced via an expensive chemical synthesis process, which limits its availability for research. This project aims to clone the psilocybin biosynthesis pathway genes (psiH, psiD, psiK, psiM) into Escherichia coli, to provide a cheaper and more reliable source of this compound. Previous work has shown that the fungal enzymes PsiD, PsiK, and PsiM are functional when expressed in bacteria, but PsiH is thus far untested. We will use codon harmonisation and N-terminal modification methods to optimise PsiH expression, in order to complete the biosynthetic pathway.

SYSU-CHINA

Location:	China	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Friday - Room 302 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 51

AdmiT: oncolytic Adenovirus with miRNA profiles Targeted

Cancer is a threat for human welfare and finding effective drugs for a specific cancer is even thornier. As miRNA is widely used for tumor classification and prognosis, we now put forward an engineered adenovirus which can conditionally kill tumor cells by targeting unique miRNA profiles in specific cell.We assume to verify this system in colon cancer, so we developed a R package screening for specific recognition and found out miR-663b, miR-885-5p and miR-592 in COAD . Then we constructed corresponding miRNA sensors and used adenovirus early gene E1A and E1B55K to determine viral replication and tumor lysis. For safety concerns, Tet-on system is applied as a switch, and suppository or enemata may be our way of drug delivery. Math model is used to anticipate that this virus can be developed into a standardized instructive protocol for various cancer types as well as an efficient admission for cancer therapy.

SYSU-Medicine

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Saturday - Room 304 - 11:30 AM
Section:	Undergrad	**Poster:**	Zone 2 - 182

Construction of targeted chemotherapy mediated by oncolytic alphavirus M1 and its multimodal anticancer effect

Cancer remains a leading cause of death in the world. Oncolytic virus, as a kind of new anticancer therapy combining the advantages of immunotherapy, gene therapy and targeted therapy, may be a promising solution. Alphavirus M1 is a natural existing non-pathogenic oncolytic virus. However, a large proportion of tumors are not sensitive enough to M1. To further enhance the therapeutic efficacy of oncolytic virotherapy, cancer chemotherapy is commonly use, which usually lacks tumor specificity and causes severe systemic side-effects. Our project is to engineer M1 to specifically encode and express enzymes that can convert prodrugs into active therapeutic metabolites, and enhance bystander effects. We also utilize riboswitch to enhance the dynamic regulation of M1. Meanwhile the Chemotherapeutic drugs can boost the tumor infectivity and lethality in diverse tumors with low sensitivity to M1. We hope to provide a novel anticancer therapeutic modality by combining oncolytic virus M1 with targeted chemotherapy.

SZPT-CHINA

Location:	China	**Track:**	Food and Nutrition
Region:	Asia	**Presentation:**	Sunday - Room 210 - 5:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 188

Antihypertensive Probiotics

Hypertension is a worldwide health problem that can even be life-threatening.Antihypertensive peptides(AHPs),a kind of food-derived short peptides,can lower blood pressure with no side effects compared with the drugs.Our team developed AHPs functional food this year.we constructed AHPs mutimers,fused the peptides to food protein and then engineered into a probiotic.The recombinant probiotic can implant in intestine,then express the fusion protein by the regulation of gastrointestinal different pH.The expressed fusion protein can be hydrolyzed by intestinal hydrolase to release the AHPs,which can be absorbed to exert a sustainable and gentle blood pressure lowering effect. This producing AHPs probiotic could be made tablet,powder,capsule,even yogurt.These product are more acceptable to people. It can be a assistant product for hypertensive patients to lower their blood pressure and also help those person with borderline blood pressure to prevent hypertension.

SZTA Szeged HU

Location:	Hungary	**Track**:	High School
Region:	Europe	**Presentation**:	Saturday - Room 310 - 3:30 PM
Section:	High School	**Poster**:	HS Zone 2 - HS 74

Detecting microcystin production of the harmful algae Microcystis aeruginosa

Microcystis is a genus of cyanobacteria frequently causing harmful algal blooms and water toxicity. Our purpose is to detect the presence of microcystin, a hepatotoxin produced by Microcystis aeruginosa under certain conditions. Microcystin is synthesized nonribosomally via microcystin synthetase encoded by the mcy genes. We have constructed plasmids where, after the promoter region, mcy genes are replaced with GFP genes. We would like to transform the plasmids into M. aeruginosa and Escherichia coli using shuttle plasmids. Upon addition of the transformed bacteria to wild-type M. aeruginosa cultures, we expect that the inserted GFP genes will be transcribed due to cell-to-cell communication. By taking samples from the growing cultures, we can determine the algae concentration which microcystin starts to be produced at. For further studies, since its sequence is unknown, we are going to sequence the promoter of mcy genes of Microcystis flos-aquae, another species abundant in Hungarian lakes.

SZU-China

Location:	China	**Track**:	Manufacturing
Region:	Asia	**Presentation**:	Saturday - Room 312 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 92

MicrancideAn RNAi-based herbicide for Mikania micrantha

Mikania micrantha Kunth is one of the most destructive invasive species in the world. It was introduced into China in the early 20th century, leading to great destruction of local environment. However, at present, the major approach for controlling Mikania micrantha Kunth is still chemical herbicide spray, which is associated with significant hazards to crops and environment. RNA interference (RNAi) is a conserved mechanism in eukaryotic organisms, in which sequence specific gene silencing is triggered by the introduction of dsRNA. In this project, we used RNAi technology to silence the genes encoding proteins with essential functions to induce mortality in Mikania micrantha Kunth through topical application of E Coli expressed RNAi molecules. In the meantime, we have developed a synthetic kit that can be used to synthesize RNAi nanoparticles of different sizes, and a siRNA sifting program for other researchers to select RNAi molecules for their specific purpose.

Tacoma RAINmakers

Location:	United States	**Track**:	Food and Nutrition
Region:	North America	**Presentation**:	Saturday - Room 306 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 213

Improving the Agricultural Potential of Rhizobia

Nitrogenous fertilizer is a vital component of food production, but unfortunately, it is both inefficient and bad for the environment. A potential alternative to chemical fertilizers is rhizobia, a microorganism that takes nitrogen from the air and converts it into nitrates. The nitrates can then be readily used by the host legume and surrounding organisms after the legume decays. Current challenges in the use of rhizobia in agriculture include desiccation, bacterial competition, and other osmotic stressors. Our project works to improve rhizobia's agricultural capabilities through overexpression of a gene involved in trehalose biosynthesis, otsA. Expected benefits include increased nitrogenase activity, increased tolerance to environmental stressors, and increased crop yield of associated legumes. This next-generation of rhizobia will be a stepping stone to transforming agricultural practices to be both economically and ecologically sustainable.

Tartu TUIT

Location:	Estonia	**Track**:	Foundational Advance
Region:	Europe	**Presentation**:	Sunday - Room 304 - 3:00 PM
Section:	Overgrad	**Poster**:	Zone 2 - 170

Pop Culture

The goal of our project is to develop the autolytic yeast strain beneficial for biotech companies. The use of the strain as a basis for yeast cell factories will ease the extraction of valuable compounds from the cells. Usually, chemical cell lysis method is used but it is quite expensive and time-consuming for large scale production.To achieve our goal, we want to introduce extra copies of the genes encoding for yeast cell wall degrading enzymes (glucanases) and modify some enzymes involved in the cell wall biosynthesis. Initially, we will induce the production of glucanases and downregulate cell wall synthesizing enzymes to make the cell wall weaker and to promote releasing of the cellular content into the media. As a next step, we hope to develop a fully automated system to control lysis of the cells. The lysis will be self-activated at a certain point of the cell lifespan.

TAS Taipei

Location:	Taiwan	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 304 - 2:30 PM
Section:	High School	**Poster:**	HS Zone 2 - HS 5

Adieu, Residues

We consume fruits and vegetables every day without knowing whether or not agricultural residues (i.e. pesticides & heavy metals) are present or in what concentration. In 2017, according to the UN, exposure to pesticides caused 200,000 to 300,000 deaths annually. Additionally, lead exposure alone is responsible for a death rate of 25.3 deaths per 100,000 individuals in East Asia.Current methods of agricultural residue detection are not easily accessible to the public and are inconvenient for everyday use. Thus, our project aims to allow for convenient visualization of agricultural residues by designing colored proteins that can directly interact with these residues. We envision a system where our designed proteins can be applied directly on food items to detect the presence of residues.Our final product can be used by consumers, distributors and farmers alike.

TAU Israel

Location:	Israel	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Saturday - Room 306 - 3:00 PM
Section:	Overgrad	**Poster:**	Zone 1 - 1

Pyo-Pyo is a novel approach for fighting resistant bacteria, based on the use of pyocins

Antibiotic resistance is defined by WHO as one of the biggest threats to global health. We suggest a solution that involves the use of R-type Pyocins, protein complexes produced by Pseudomonas aeruginosa. Pyocins resemble bacteriophage structures while the killing spectra is determined by the pyocin tail fiber.Pyo-Pyo is a modular and controllable system created in a non-pathogenic E. coli which is served as a flexible 'drug factory'. By replacing the original pyocin tail fibers with other tails the pyocins are engineered to target different bacterial pathogens. Our solution also includes software, based on novel algorithms, for both designing the relevant tail fibers to target specific bacteria, and for optimizing the distribution of the pyocins in a specific medium for cost-effective usage. In further experiments, we wish to regulate the expression of the pyocins by varying inducing agents and to provide a complete POC for a variety of future uses.

Tec-Chihuahua

Location:	Mexico	**Track**:	Environment
Region:	Latin America	**Presentation**:	Sunday - Room 306 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 17

Recombinant production of plant defense peptides to inhibit Verticillium wilt in cotton crops

Verticillium dahliae is a phytopathogenic fungus that affects more than 300 species worldwide. It attacks plant's vascular system causing wilting, also reduces the product's quality affecting overall crop production. Every year, around 150,000 tons of cotton have been lost per year due to this particular organism.To prevent and inhibit the disease caused by V. dahliae, the transformation of E. coli to produce the three following plant antifungal peptides recombinantly, is presented: AtPFN1 has shown the ability to break down fungal cell walls, even when found as spores; WAMP1B inhibits the enzyme fungalysin, which is a fungal response to the plant's defense mechanism; Finally, PsDef1 produces morphological changes to fungal mycelium. Moreover, the coexpression of the peptides with chaperone molecule Erv1p is designed to improve disulfide bond formation.Additionally, the elaboration of a systemic, preventive and treating biofungicide using the produced recombinant antifungal peptides as an active ingredient, is proposed.

Tec-Monterrey

Location:	Mexico	**Track**:	Foundational Advance
Region:	Latin America	**Presentation**:	Friday - Room 311 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 220

Breathe-in

Cystic fibrosis(CF) is a progressive genetic disease that causes de-generation of lung conditions and induces the proliferation of mul-tidrug resistant bacterial strains (MRBS). Combination of treatmentswith antibiotics and mucolytics has become an alternative for treate-ments against P. aeuroginosa, an opportunist pathogen that grows inthe respiratory tract of CF patients and has become their principalcause of death.We present a conceptual pipeline for the discovery of antibioticsusing a variety of whole-cell biosensors that, when co-cultivated withsecondary metabolite producers, sense the presence of antibiotics andthe possible chemical identification of such compounds, using a mi-crofluidic system coupled to a mass-spectrometer; as well as a newtreatment using a neuraminidase as a mucolytic to reduce the viscos-ity of mucines in CF patient's lungs.

Technion-Israel

Location:	Israel	**Track**:	Food and Nutrition
Region:	Asia	**Presentation**:	Friday - Room 313 - 9:00 AM
Section:	Overgrad	**Poster**:	Zone 3 - 255

Creating BeeFree honey by using a synthetic bee stomach

Honeybees produce honey to make the flower's nectar more digestible and well-preserved, using various enzymes secreted to their honey stomach. The honey possesses unique properties that make it highly attractive in fields such as medicine, cosmetics, and food industry. Nowadays, the honey industry depends on honey produced by bees, which therefore harm them and their natural social structure.Our vision is to create a sustainable 'bee-free honey' using engineered bacteria, which will process a nectar-like solution and secrete enzymes that mimic the honey stomach environment. The engineered bacteria will be separated from the final product using membrane-based capsules, providing the bacteria's favorable growth medium inside the capsule, while allowing enzymes secretion to the external 'nectar' solution. We have also designed a synthetic circuit that will regulate the transcription of the essential enzymes, enabling us to obtain a solution consisting of real honey properties.

TecMonterrey GDL

Location:	Mexico	**Track**:	Diagnostics
Region:	Latin America	**Presentation**:	Sunday - Room 311 - 9:30 AM
Section:	Overgrad	**Poster**:	Zone 1 - 98

Gliksys bio-ink

Owing to the increasing prevalence of diabetes, novel approaches for continuous glucose monitoring (CGM) that can be readily implemented without the need for trained personnel or specialized equipment are highly ideal. Bacterial whole-cell biosensors (WCBs) capable of continuous monitoring of diabetes-related parameters could be used to engineer devices that can help diabetic patients achieve and maintain normal blood glucose levels. We hypothesize that genetically engineered bacteria encapsulated within a polymeric matrix (a bio-ink) can be used to biofabricate wearable/implantable WCBs for CGM such as epidermal bio-tattoos, microneedles, and implantable scaffolds. Furthermore, the ability of WCBs to transduce biological recognition into a colorimetric signal will allow the design of devices that do not require expensive analytical equipment or trained personnel to be applied and interpreted. This approach provides several advantages over conventional electrochemical biosensors such as the potential for multiparametric measurements, autonomy, simplicity, cost-effectiveness, and ease of administration/interpretation.

TelHai-Migal Israel

Location:	Israel	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Friday - Room 309 - 5:00 PM
Section:	Overgrad	**Poster:**	Zone 3 - 254

LOGENEGATE for Cancer Therapy

Protecting healthy tissue from off-tumor toxicity is a major challenge facing all strategies for cancer immuno-gene therapy. Implementing logic AND gates to strictly confine the expression of therapeutic genes or their effects to selected target cells is an intriguing concept in this direction. In a 2017 Cell paper Nissim et al. presented a revolutionary AND gate device comprising a two-module mRNA circuit and demonstrated the expression of a multi-component immunostimulatory cassette only in cancer cells in which two distinct promoters are active. A major safety concern associated with this design is inevitable, potentially detrimental, basal off-target expression of genes of interest. To obviate this risk we have created LoGENEgate, an entirely new AND gate apparatus based on mRNA trans-splicing. Here we show that unlike the original Cell modules, LoGENEgate totally precludes expression of a model gene in off-target cells. Our findings pave the way for numerous therapeutic applications of LoGENEgate.

Thessaloniki

Location:	Greece	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Saturday - Room 313 - 5:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 171

POSEIDON: Programmable Orthogonal Systems Engineered Into DNA Oligo Networks

We present POSEIDON, a molecular toolkit that harnesses the versatility of nucleic acid networks to investigate intramolecular events that regulate gene expression. With functionality determined entirely by the secondary structure of DNA, strand displacement has emerged as a highly adaptable artificial molecular system with programmable behaviour for cell-free biochemical networks. Through the exploitation of DNA Strand Displacement molecular computation, our toolkit is able to quantify and characterize DNA-Protein interactions. Our team has utilized the principles of DNA circuitry to shed light into the mechanisms of gene activation and transcription factor binding by introducing the protein's target sequence in the processing algorithm. As a proof-of-concept, transcription factors participating in metastatic melanoma are being examined through the lens of molecular programming, to elucidate potential intracellular pathways and therapeutic targets. For the project's outgrowth, we envision an ensemble of advanced modular DNA circuits able to thoroughly investigate complex protein behaviours in malignant pathways.

Thessaly

Location:	Greece	**Track**:	Diagnostics
Region:	Europe	**Presentation**:	Friday - Room 210 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 189

ODYSSEE: A modular platform for field diagnosis of Tuberculosis

Tuberculosis (TB) is one of the 10 deadliest diseases worldwide, causing around 1.3 million deaths in 2017 and nearly 3 million people are left undiagnosed, each year.Once Mycobacterium tuberculosis, which causes the disease, dies in a patient's lung, it releases DNA fragments into the blood that eventually appear in urine. We developed a diagnostic test that detects these fragments by targeting the specific gene IS6110. After 4 rounds of amplification including isothermal amplification, in vitro transcription/translation of a toehold switch and a colorimetric readout enabled by b-lactamase, the results can be visualized with a naked eye. Our design can be easily implemented for several diseases due to its universality and modularity.As TB is a leading health threat for populations affected by crises, our test is destined to be applied in refugee camps in Greece, as well as worldwide, making a step towards achieving universal health coverage.

Tianjin

Location:	China	**Track**:	Foundational Advance
Region:	Asia	**Presentation**:	Friday - Room 304 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 30

Evolutionary Fusion

Since the Darwin era, the formation, accumulation and even retention of differences between species and species has not only been a core issue in evolutionary biology, but also one of the fundamental problems facing the entire life sciences. Cell fusion, as an effective way to exchange genetic material among distant species, is of great significance for the study of species evolution. The goal of iGEM Tianjin this year is to integrate a new chassis organism that contains a set of heterogeneous chromosome stabilization elements. To this end, we have combined Saccharomyces cerevisiae and Yarrowia lipolytic yeast to establish a key component of the chromosome by centromere, and at the same time created a new system based on sequential single-base editing technology to characterize the fusion results.

TJUSLS China

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Sunday - Room 304 - 5:30 PM
Section:	Undergrad	**Poster:**	Zone 1 - 18

Achilles' Heel of Metallo-Beta-Lactamases

With the continuous emergence and rapid spread of multidrug-resistant bacteria (MDRB) resulting from the misuse of antibiotics, it is imperative to develop novel therapies against them. One of the major mechanisms of bacterial resistance is that MDRB can produce beta-lactamases which degrade antibiotics, so finding new-type inhibitors is significant in the treatment of diseases associated with MDRB. Therefore, we focus our project on hitting Achilles' heel of metallo-beta-lactamases (MBLs), a vital class of beta-lactamases without available clinical inhibitors. We use synthetic biology methods to express a series of MBLs in E. coli, and then screen out effective inhibitor compounds via high-throughput screening with fluorescent probe (CDC-1) from several drug libraries. Also we assess their inhibitory ability in living bacterial cells by UV-vis. Our results shows that screened inhibitors improve the effect of beta-lactams when applied simultaneously to living bacteria, which are ideal candidates for therapeutics for diseases caused by MDRB.

TokyoTech

Location:	Japan	**Track:**	New Application
Region:	Asia	**Presentation:**	Friday - Room 302 - 3:30 PM
Section:	Undergrad	**Poster:**	Zone 1 - 73

E-Turing- Formation of Turing patterns in a synthetic bacterial population under more natural environment

A variety of sophisticated patterns on the body of animals touches a chord. Many of them can be almost reproduced based on the theory called 'Turing Patterns'. Previously, the patterns cannot be formed unless the organism goes through inherent developmental stages.Our team applies the method of synthetic biology and engineers Escherichia coli whose group can produce Turing patterns. A few previous studies did not approach the recreation of natural environment where the presence of physical stimuli has a profound effect on the development of organisms. Thus, we fine-tuned the behavior of bacteria so that temperature and light can play a major role in the formation of pattern.One of the most familiar example of Turing pattern expressed on human body is a fingerprint. Our team also creates a new model that can regenerate a missed part of fingerprint to enhance the value of stochastic pattern formed in wet lab.

Tongji China

Location:	China	**Track**:	Manufacturing
Region:	Asia	**Presentation**:	Sunday - Room 310 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 3 - 238

IR 2.0: Indigo Revolution 2.0

Indigo is a dye originally extracted from plants, commonly used to dye denim, the use of it dates back 6,000 years. However, plants cannot produce enough indigo for human. To fulfill the expanding demand for indigo, chemical synthesis was developed in the 20th century; this is what we call 'the first indigo revolution(IR 1.0).'As time goes by, we come to realize that the new procedure to produce and use indigo is creating too many pollutions. China is the largest indigo supplier in the world, as its environmental law become stricter, local enterprises are facing challenges on the increasing environmental cost.We are trying to use biosynthesis to solve both environmental and cost problems. Based on the work of 2013 iGEM team Berkeley, we have designed an improved biosynthesis pathway to produce indican instead of indigo and trying to demonstrate it in an high-tryptophan-production E.coli strain.

Tongji Software

Location:	China	**Track**:	Software
Region:	Asia	**Presentation**:	Saturday - Room 310 - 11:30 AM
Section:	Undergrad	**Poster**:	Zone 1 - 32

Pathlab: An integrated platform for pathway construction with enzyme information

With the development of synthetic biology, it is possible to design metabolic pathways and achieve them. Therefore, an integrated platform for pathway construction is needed urgently. Our software, Pathlab, perfectly caters to this demand with accurate and efficient algorithms and open data in the KEGG and BRENDA databases. Considering thermodynamic feasibility, material competition of heterogeneous reactions and toxicity of intermediates, Pathlab constructs an optimal synthetic pathway in E. coli or the yeast which is based on the available substrates or desired products. Meanwhile, the enzyme required for each reaction in the pathway will be selected first according to thephysical and chemical properties and the affinity with biological chassis, and then be provided after optimization by codon preference. Moreover, Pathlab provides additional functions, such as word clouds for keywords of pathway-related literature, search engine for promoters and parts used in iGEM□etc.

Toronto

Location:	Canada	**Track**:	Manufacturing
Region:	North America	**Presentation**:	Friday - Room 210 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 137

Optimizing plastic degradation with optimization of PETase

Plastic pollution is a large-scale environmental burden. An economy of single-use plastics, commonly made from polyethylene terephthalate (PET) due to its high crystallinity and resistance to degradation, has led to the production of millions of tons of plastic that is improperly disposed. Remarkably, an enzyme produced by Ideonella sakaiensis, termed PETase, can degrade this polymer at ambient temperatures. Combining the recent mutations derived from Austin et al., (2018) to increase the catalytic activity of PETase, our goal is to further optimize the thermostability and catalytic ability of PETase, through targeted mutagenesis, creating sequences using rational design and machine learning algorithms. With further optimization, we believe PETase may offer an eco-friendly and cost-effective solution to industrial plastic recycling efforts. Moreover, as the byproducts of PET degradation, terephthalic acid (TPA) and ethylene glycol (EG), are valuable feedstocks for PET production, this approach offers the possibility of close-loop recycling.

TPHS San Diego

Location:	United States	**Track**:	High School
Region:	North America	**Presentation**:	Saturday - Room Ballroom A - 5:30 PM
Section:	High School	**Poster**:	HS Zone 2 - HS 8

Breakdown of Trimethylamine via Trimethylamine Dehydrogenase to Minimize Heart Disease Caused by Red Meat Consumption

The consumption of red meat has been linked to atherosclerosis, a form of heart disease caused by the buildup of plaque in the arteries. Recently, it was discovered that the combination of choline and L-carnitine from red meat are converted to trimethylamine (TMA) in the body. TMA is a precursor to trimethylamine N-oxide (TMAO), which is found to exacerbate cholesterol buildup, ultimately leading to atherosclerosis. In this study, we targeted this pathway by breaking down the precursor, TMA, before TMAO is formed. A system designed to concurrently degrade TMA and subdue its toxic by-product, formaldehyde, was implemented in E. coli for these purposes. This system is composed of Trimethylamine Dehydrogenase (TMADH) and Formaldehyde Dehydrogenase (FDH) which are being tested independently for their degradation properties. Our approach has proven that TMADH is effective in TMA degradation and FDH can be expressed in a bacterial vector to minimize the presence of formaldehyde.

Tsinghua

Location:	China	**Track**:	New Application
Region:	Asia	**Presentation**:	Saturday - Room 310 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 146

PhASE

Cellular compartmentation is critical for highly efficient and organized intracellular activities, yet artificial control of cellular compartments for catalysis or signaling remains challenging. This year, PhASE creatively utilized light-inducible phase separation as a switch in E.coli to redistribute biomolecules into compartments called 'phase' in a spatio-temporal manner, in order to manipulate cellular activities. We demonstrated two applications of PhASE: Firstly, by driving enzymes and substrates in and out of a phase, we could control the overall efficiency of enzymatic reactions. Secondly, since some proteins only phase-separate at one end of a cell, we explored the potentiality of this system for cell heterogeneity induction with high time resolution. Additionally, we tried to explain the pattern of phase formed in E.coli using morphologically engineered cell lines. We anticipate our work to be a novel approach to modifying intracellular activities in E.coli.

Tsinghua-A

Location:	China	**Track**:	Open
Region:	Asia	**Presentation**:	Friday - Room Ballroom A - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 71

No title

This year we are exploring the area of DNA data storage. We built a model of the in vitro process from DNA synthesis to sequencing to get a quantitative understanding of errors introduced in DNA information channel,and tried to use hierarchical primer and omega primer in PCR to provide flexible retrieval mechanism. On the basis of these, we developed program running in silico for data encoding and encryption with improved fountain code and chaotic encryption, image similarity and hierarchic retrieval with CNN and PCA, and file indexing and modification. To demonstrate our design, we synthesis 12K DNA sequence into which we encode Tsinghua Bamboo Slip, quotes from Assassin Creed and other contents(130KB in total). Integrating multiple parts of our project, we also built a software to simulate the whole DNA data storage system and tell people what's happening with animation.

TU Darmstadt

Location:	Germany	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Saturday - Room 210 - 2:30 PM
Section:	Overgrad	**Poster:**	Zone 2 - 196

The Real MVP - The Expression System for Modular Virus-like Particles

Our goal is the development of a standardized, modular system based on biological nanoparticles to accelerate the research and development of novel vaccines, targeted drug delivery and other promising applications. The toolkit is based on virus-like particles (VLPs) which offer a multitude of desirable properties. VLPs are protein shells of viruses which are no longer infectious due to the lack of nucleic acids. For our purposes we use the bacteriophage P22 whose capsid can be produced via heterologous expression in variable hosts. The complex protein shell consists of two important compounds: the scaffold-protein (SP) and the coat-protein (CP). The CP is modified with an extension-tag. Therefore, an enzyme called sortase can connect any protein of interest which contains a corresponding tag. With the sortase modification the VLP functionality can be adapted to ones liking in no time, leading to a reduction in production and development costs for VLP-based technologies.

TU Dresden

Location:	Germany	**Track:**	Diagnostics
Region:	Europe	**Presentation:**	Saturday - Room 210 - 4:30 PM
Section:	Overgrad	**Poster:**	Zone 1 - 49

DipGene Designing a Gene-Sensitive Paper Strip

The identification of specific DNA sequences is needed in many contexts. Its applications range from testing for genetic diseases or viruses that integrate into the human genome to checking for the presence of antibiotic resistances in pathogens. Current state of the art methods are expensive, slow and require advanced technologies, which make genetic testing only accessible to researchers and not to most of humanity.We aim to provide a tool for detecting any nucleic acid sequence of interest from microbial samples and human cells. By combining a novel DNA extraction method with a newly designed fusion protein, it will be possible to obtain a visual color readout within minutes, which will indicate the presence or absence of the sequence of interest. Our method is designed to be utilized in the field, meaning it will be cheap, fast and easy-to-use and will not require any advanced technologies or electricity.

TU Eindhoven

Location:	Netherlands	**Track**:	Diagnostics
Region:	Europe	**Presentation**:	Saturday - Room 311 - 10:00 AM
Section:	Overgrad	**Poster**:	Zone 1 - 60

dCastect: Fast detection of bacterial pathogens with the use of specific bacteriophages and dCas9-NanoLuc

The discovery of new antibiotics lags behind the continuing increase in antimicrobial resistance (AMR), a process heavily accelerated by the misuse of antibiotics. Antibiotics are misused in a preventive manner (mainly cattle), misused to treat non-bacterial-related ailments and misused by unspecific treatment of bacterial infections. With our fast and specific diagnostic method for bacterial infections, this will become a problem of the past. Our modular method uses the specificity and amplification speed of bacteriophages in combination with the specificity and sensitivity of the dCas9-NanoLuc-complex to revolutionize the diagnosis of bacterial infections. Our method enables the diagnosis of infections within an hour, making fast and specific use of antibiotics possible. Moreover, the application of this method is broad; from fast specific diagnosis of infections, both in human as well as in veterinary medicine, to going beyond the diagnosis of infections by detecting bacteria in drinking water or in the food industry.

TU Kaiserslautern

Location:	Germany	**Track**:	Environment
Region:	Europe	**Presentation**:	Sunday - Room 313 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 23

Chlamy Yummy - Revolutionizing plastic degradation by introducing Chlamydomonas reinhardtii as a eukaryotic secretion platform

Plastic pollution is threatening life in all environment niches on this planet. We are taking action to save our planet by developing a biological recycling method for PET, a major plastic component. By inserting the genes for PETase and MHETase into the green algae, C. reinhardtii, we enable the degradation of PET into its monomers. These will be purified and used for resynthesizing PET. Our Bio-enzymatic environmentally friendly recycling method has a lower energy consumption in contrast to conventional recycling methods that rely on high pressure and temperature. Our approach allows the resynthesis of virgin PET, thereby maintaining the quality of newly synthesized plastics, while eliminating the need for new PET synthesis. We aim for our recycling system to become established in waste management and water treatment centers worldwide. Our Vision is to eliminate pollution of our environment with macro- and microplastic by developing a closed circle economy for PET!

TUDelft

Location:	Netherlands	**Track:**	Foundational Advance
Region:	Europe	**Presentation:**	Sunday - Room 311 - 5:30 PM
Section:	Overgrad	**Poster:**	Zone 2 - 150

Sci-Phi 29: Enabling orthogonal replication and predictable expression to expand the repertoire of engineerable bacteria

Engineering non-model bacteria is extremely laborious and expensive, which restricts the scope of synthetic biology to a small subset of the bacterial cosmos. In our project, we developed a tool that aims to expand the repertoire of bacterial species and broaden the range of substrates and environmental conditions which is currently used in synthetic biology. Sci-Phi 29 is a tool used to express genetic circuits independently of the bacterial host. Orthogonal replication of an exogenous DNA molecule is performed by the phi29 bacteriophage DNA replication system based on only four proteins. Furthermore, we developed a predictable and transferable expression system across multiple bacterial species. Our approach is based on an incoherent feed forward loop that ensures independence to DNA copy number and is robust to transcriptional and translational variations Sci-Phi 29 is a versatile platform to further explore the bacterial diversity providing new opportunities for the advancement of synthetic biology.

Tuebingen

Location:	Germany	**Track:**	Therapeutics
Region:	Europe	**Presentation:**	Saturday - Room 312 - 4:30 PM
Section:	Overgrad	**Poster:**	Zone 3 - 249

GLP.exe - E.coli Nissle 1917 biosafety chassis with CRISPR/Cas3 kill-switch and Exendin-4 in Diabetes treatment

We are developing E.coli Nissle 1917 as a microbial chassis that produces a drug for the safe treatment of Type 2 Diabetes Mellitus. The chassis will provide glucose-dependent Exendin-4 secretion, a GLP-1 analogue efficiently increasing insulin secretion and supporting weight-loss in diabetes patients. In silico-confirmed cell-penetrating peptides will be utilized to make the Exendin-4 available in the pancreas.Moreover, a novel CRISPR/Cas3-based kill-switch with environmental-sensing systems will be used for biocontainment of the chassis. To evaluate the robustness of our probiotic strain, our project aims to extensively characterize it via RNA-seq. Finally, the first metabolic model of Nissle is under development.Concerning human practices our project involves various knowledge transfer opportunities, public outreach and data collection, as well as an overt dialogue and intense collaborations with other iGEM teams. Overall, the aim of this project is to overcome the physical, emotional and financial burden of Type 2 Diabetes Mellitus.

Tufts

Location:	United States	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Friday - Room 306 - 3:00 PM
Section:	Overgrad	**Poster**:	Zone 1 - 27

Improving and Expanding Functions of Bioelectric Sensors

Our team aims to improve and expand function of a bioelectric chemical sensor, by genetically engineering Shwanella Oneidensis to emit electrical current in response to concentrations of an analyte. We are focusing on dampening effects of leaky transcription by adding degradation tags to the output protein, as well as testing the sensor with new constructs for detecting different analytes than was previously used with this sensor (Arabinose, Mercury, etc).

Tunghai TAPG

Location:	Taiwan	**Track**:	Environment
Region:	Asia	**Presentation**:	Sunday - Room 313 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 16

Eco-life, better life

It is the Tunghai team's first year to compete in the iGEM competition . Our team consists of 15 students working together in multidisciplinary teams to achieve our goal. Our members come from different backgrounds, with majors such as chemistry, chemical engineering, biology. However, we have something in common- we all are interested in synthetic biology and admire the concept of iGEM. At first, we were frustrated because of all of the details that need to be carefully accounted for, but after a lot of dedication , we observed that people are suffering HAI(Hospital Acquired Infection) these days. It can't be denied how crucial the whole environment is to this human being. Therefore, we invented a new product and named it 'EcoLife', with its primary purpose being a air purifier. With this product, we are looking to provide a instrument alternative for those who pursue a healthy life.

UA Huntsville

Location:	United States	**Track**:	New Application
Region:	North America	**Presentation**:	Saturday - Room 302 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 219

CosmiColi: Using exogenous tardigrade proteins to improve radio tolerance of E. coli cell line IR9-50-1

Increased background radiation in space causes a significant increase in the mutation rate of bacterial genes which threatens the validity of biological experiments performed in environments such as the International Space Station. K12 derived cell line IR9-50-1 contains genomic mutations to RecN, RecD, and RpoBC which allow it to withstand up to 2500 Gy. CosmiColi will be engineered by introducing exogenous tardigrade derived radiation resistance proteins Dsup and CAHS to IR9-50-1. Our team hypothesizes that CosmiColi will have greater radio tolerance compared to wild type IR9-50-1 and wild type parent strain MG1655. Radio tolerance is tested by comparing the growth and the rate of gain of function mutations in all three cell lines. Growth is quantified by measuring optical density of overnight cultures. Gain of function mutations are measured by the restoration of antibiotic resistance.

UAAAN

Location:	Mexico	**Track**:	Energy
Region:	Latin America	**Presentation**:	Friday - Room 310 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 104

Bio Hydro-Gene

In our project BioHydro-Gene, we are using genes from C. reinhardtii bacteria. This are related with the glucose metabolism (the hydrogenase enzyme (Hyd1), ferredoxin, ferredoxin-NADP-reductase (FNR) and the maturation enzymes (HydEF and HydG)) to transform E. coli (DH5α).The genetically transformed strain will be placed on a MFC so that the molecular hydrogen will be used to generate electricity and H2O as a byproduct.In this process hydrogen molecules are generated, some of those, are going to be selected using a specific proton membrane.As hydrogen fuel cells generate energy through the hydrogen redox reaction with atmospheric oxygen, the only byproduct of this process is water, electric power can be generated to manufacture and enhance homes. Through the production of biohydrogen, we seek to generate a source of clean hydrogen fuel to bring electricity to different communities that do not have the technology or support to have this service.

UAlberta

Location:	Canada	**Track**:	Food and Nutrition
Region:	North America	**Presentation**:	Friday - Room 313 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 101

The Beetector: Developing a bacteriophage-based diagnostic system for a fatal honeybee parasite

Honeybees are an essential contributor to our food supply. In addition to producing honey, bees pollinate one-third of all plants and plant products we eat. Nosema ceranae is a debilitating fungal parasite that is the most widespread honeybee pathogen in Canada. In addition to the difficulties in treating Nosema ceranae infections□□a problem that Team UAlberta tackled last year□□current detection methods are slow and costly, and infected hives are often diagnosed too late for effective treatment. Team UAlberta is working to change that by developing The Beetector, a field-ready paper-based test for the detection of Nosema ceranae in bee samples. The system is comprised of M13 phage labelled with a chromoprotein and displaying a ligand specific to Nosema spores. Based on the colour intensity of the diagnostic paper strip, the severity of the hive infection can be assessed, thus democratizing diagnosis and facilitating effective treatment of Nosema ceranae.

UANL

Location:	Mexico	**Track**:	Manufacturing
Region:	Latin America	**Presentation**:	Friday - Room 210 - 4:30 PM
Section:	Undergrad	**Poster**:	Zone 3 - 225

E. compa: Bacterial Synthetic Organelle for Toxicity Reduction and Metabolic Optimization

This project aims to implement Bacterial Micrcompartments (BMC)to E. coli as nanoreactors for industrial biotransformation of phenolic compounds present in pre-processed organic waste from lignocellulosic industry called Black Liquor (BL). This will be achieved through encapsulation of a triple enzyme pathway inside of an engineered Propanediol Utilization (PDU) system, a type of BMC from Salmonella. The pathway transforms vanillate, present in BL (initial genetic circuit inductor) in to protocatechuete (secundary inductor), catechol and finally in to cis-cis-Muconate, a chemical used in some polymer production. This strategy will optimize the flux through metabolic channeling, toxic intermediate sequestration and dynamic metabolic control. PDU protein, PduU, was modified through protein engineering to increase flux of substrate into BMC, and Molecular Dynamics Simulations were performed to predict its stability, as well as the permeability of metabolites. Our goal is the design of BMCs as a device to optimize the biosynthesis of compounds.

UC Davis

Location:	United States	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Saturday - Room 210 - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 195

Lighting the way: developing foundations for open-accessmammalian synthetic biology for iGEM and beyond.

Mammalian synthetic biology promises a future built on advances in personalized medicine, modeling, and manufacturing. However, fewer than 5% of iGEM teams have used mammalian cells in their projects. We examined the factors hindering the accessibility of mammalian synthetic biology, focusing on challenges that limit the rapid prototyping of synthetic systems. Specifically, we worked to simplify the process of characterizing mammalian parts and devices. Through our work characterizing the transfer functions of endogenous gene expression for light-activated CRISPR/dCas9-based effector (LACE) systems, we developed generalizable methods and tools that have application for LACE and other device classes. Our toolkit allowed us to make quantitative comparisons between multiple device variants and to explore the contextual dependence of device function in different cell lines and for multiple genes. We share our methods and propose these foundational advances may help accelerate the spread of mammalian synthetic biology throughout iGEM and beyond.

UC San Diego

Location:	United States	**Track**:	Diagnostics
Region:	North America	**Presentation**:	Friday - Room 311 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 3

ALAIVE (ALzheimer's AI VErifier)

Despite the billions of dollars spent researching Alzheimer's disease (AD), it remains incurable and affects around 35 million people worldwide. Early diagnosis of AD is critical for proper disease management and accelerating AD research. Our team proposes the development of a panel of antibodies to diagnose Alzheimer's disease years before its onset by detecting immunologic changes in peripheral blood. We will construct an in vitro model of AD by exposing microglia cells co-cultured with beta amyloid to T-cells. Using a phage display library of random sequences, we will obtain phage binding profiles for these T-cells. This profile will be processed using an algorithm based on amino acid structural similarity clustering to identify antibody sequences that can distinguish between normal T-cells and T-cells exposed to Alzheimer's neurons. Deep learning segmentation and antibody epitope prediction will then be used to identify the most probable proteins and pathways that these antibody sequences target.

UCAS-China

Location:	China	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Friday - Room 310 - 11:00 AM
Section:	Undergrad	**Poster**:	Zone 3 - 247

Ark.micro

Microbial therapies possess unique advantages in solving key challenges that are associated with current treatments. Our Ark.micro is a universal platform for microbial therapies with safety and efficiency, allowing the easier engineering of 'new generation' therapies. For metabolic disorders like phenylketonuria, our Ark.micro can support the Phe-metabolizing enzymes to compensate genetic defect. For diseases which require for a long-term drug-supply like Parkinson's disease, it can consistently provide L-dopa to free the patients from bothering taking pills frequently. Further, our therapeutic bacteria can precisely respond to the temperature change using our high-performance thermosensitive switch. Thus, they can be engineered to only survive and release drug under certain temperature condition, avoiding potential risks from unexpected bacteria distribution or negative side-effect of the drug. By the assistance of our hardware, a small electronic gut capsule, which can restrictively heat the lesion part, we consider our Ark.micro to be a promising anticancer platform.

UChicago

Location:	United States	**Track**:	Manufacturing
Region:	North America	**Presentation**:	Saturday - Room 312 - 3:30 PM
Section:	Undergrad	**Poster**:	Zone 3 - 270

No title

No abstract

UCL

Location:	United Kingdom	**Track**:	Therapeutics
Region:	Europe	**Presentation**:	Sunday - Room 304 - 5:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 163

Engineering encapsulins to be modular targeted drug delivery vehicles for cancer treatment

Currently, the most commonly used cancer treatments are burdened by severe and undesirable side-effects. Several strategies have been employed to create targeted drug therapies which are able to effectively destroy cancerous cells while minimising effects on healthy ones. These include using antibodies and various types of polymer or lipid based nanoparticles. However, often such treatments are expensive, require substantial post-production modifications, or have stability issues. Encapsulins are highly stable, cheap, bacterially produced nano-compartments. We genetically fused HER2 targeting peptides to the encapsulins' surface, and loaded them with photosensitisers, proteins which are able to produce reactive oxygen species (ROS) upon illumination with a specific wavelength of light, to create a double selection targeted drug delivery vehicle. When introduced into the bloodstream, the encapsulins would travel to the tumor site, specifically bind to cancerous HER2 expressing cells, and will begin producing toxic ROS when illuminated - destroying only the cancerous cells.

UCopenhagen

Location:	Denmark	**Track**:	Diagnostics
Region:	Europe	**Presentation**:	Sunday - Room 210 - 11:00 AM
Section:	Overgrad	**Poster**:	Zone 1 - 55

Ovulaid - Rethinking Fertility Tracking

More than 90 million people worldwide are affected by infertility issues. To combat these issues, we present an innovative femtech medical device: Ovulaid - rethinking fertility tracking.Ovulaid is a yeast biosensor in a chewing gum. Our GPCR-based biosensor utilizes the refactored pheromone pathway to measure sex hormones - estradiol and LH - in saliva, producing visible color. This allows women to track their menstrual cycle and determine their fertile window. For easy monitoring we have created an app to interpret color in a photo of the gum.We have consulted multiple experts, involved our target group internationally and integrated concerns regarding safety, yeast viability, and taste into our product. We have confronted the legal and entrepreneurial difficulties our product could face, with great help from the iGEM community. With Ovulaid we hope to spread infertility awareness and help to solve the issues of infertility for women and couples worldwide.

UCSC

Location:	United States	**Track**:	Manufacturing
Region:	North America	**Presentation**:	Saturday - Room 313 - 11:00 AM
Section:	Overgrad	**Poster**:	Zone 3 - 271

Vitrum: Protecting Newcastle Disease Vaccine with Intrinsically Disordered Proteins

The University of California, Santa Cruz (UCSC) 2019 iGEM team, Vitrum, is developing a heat-stable vaccine formulation. Our novel approach uses intrinsically disordered proteins (IDPs) to protect the live-virus vaccine for Newcastle disease. Newcastle disease virus (NDV) is highly infectious among avian species, most notably chickens. This can result in the euthanization of an entire flock to prevent further spread of the disease. IDPs have previously been shown to provide protection for desiccation and heat at the level of organism, individual cells, and isolated protein. In this study, we examine protection of live-virus, potentially relaxing refrigeration requirements for this essential vaccine.

UESTC-China

Location:	China	**Track**:	Environment
Region:	Asia	**Presentation**:	Saturday - Room 302 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 3 - 240

An Expired Drug Solution

According to the survey, 79% of households have expired drugs. In areas where waste sorting is carried out, expired drugs are classified as hazardous waste, and the treatment methods are still landfill and incineration, which still pollute the environment. In areas where waste separation is not implemented, expired drugs are treated together with household waste, and the damage to soil and water can not be ignored. The presence of expired drugs in sewage can lead to increased antibiotic resistance of many microbial strains in sewage. How to effectively treat expired drugs has become a problem that needs to be solved. Therefore, we designed an expired drug recycling bin, taking the most commonly used antibiotic ciprofloxacin as an example, using engineering E. coli to degrade expired drugs into environmentally friendly substances, and then using mathematical modeling to design points in the city to form an expired drug solution.

UESTC-Software

Location:	China	**Track:**	Software
Region:	Asia	**Presentation:**	Saturday - Room 310 - 12:00 PM
Section:	Undergrad	**Poster:**	Zone 2 - 172

BioMaster 2.0

Synthetic biology desiderates a gene computer-aided design (Gene-CAD) system. BioMaster is dedicated to contributing a complete and comprehensive database, which is essential for the Gene-CAD. BioMaster integrated databases such as UniProt, STRING and GO on the basis of iGEM Registry to provide more comprehensive BioBrick information. Based on the version 1.0, BioMaster 2.0 has significantly stridden in three aspects: data integrity, searching accuracy and user friendliness. We doubled our main reference databases by adding KEGG, BRENDA and other enzyme-related databases. Considering the feature of sequence annotation, we adopted filtering strategy with novel model to enhance the accuracy of mapping among databases. In addition, we redesigned and reconstructed the website architecture and database structure, and established a weight algorithm for searching results recommendation. All endeavors make BioMaster 2.0 a more integrated and more user-friendly database, which provides synthetic biologists with stable data updating and search services in the long term.

UFRGS Brazil

Location:	Brazil	**Track:**	Environment
Region:	Latin America	**Presentation:**	Sunday - Room 306 - 4:30 PM
Section:	Undergrad	**Poster:**	Zone 1 - 90

GlyFloat - Floating away with glyphosate!

Glyphosate is a synthetic phosponate able to block the EPSPs enzymes in some plant species and is the main active compound of the most used agrochemical worldwide. Anually, more than 170,000 tons of glyphosate are applied over brazillian crops, and a considerable amount is carried by rain to therivers and lakes. Glyphosate has already been shown to cause mutations in fish, malformation in amphibious species and superreproduction of snail species. There is still a strong debate over its effects to human health. UFRGS_Brazil team aims to engineer Escherichia coli K12 to correct its endogenous C-P lyase operon, remove a repressor and change the promoter region to a constitutive one. We designed a 3D model of a stationary filter to validate our biofiltering system. We also designed a lac-dependent kill-switch to ensure that the genetically engineered bacteria will not survive out of the alginate shells it will be trapped upon.

UGA

Location:	United States	**Track**:	Food and Nutrition
Region:	North America	**Presentation**:	Sunday - Room 210 - 4:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 149

Engineering an Inherent Resistance to Aflatoxin B1 (AFB1) in Peanut Plants

Aflatoxin B1 (AFB1) is a highly toxic metabolite that is known to contaminate peanut crops and is responsible for a number of health complications within Georgia. An inducible expression system that can isolate aflatoxin affected crops was engineered using the Gal4/UAS system and single-chain variable fragments (ScFvs). Gal4 is a transcriptional factor that binds to an upstream activating sequence (UAS), which in turn drives the expression of a downstream gene. The primary gene of interest was BS3, an apoptotic initiator derived from C. annuum. The binding and activating domains of Gal4 were each fused to a unique ScFv that is specific to AFB1. Upon exposure to AFB1, each ScFv will bind to AFB1 and allow Gal4 to induce indirect expression of BS3. All in all, the Gal4/UAS system is a novel idea in the field of plant pathology and holds great potential to enhance peanut production within Georgia.

UI Indonesia

Location:	Indonesia	**Track**:	Diagnostics
Region:	Asia	**Presentation**:	Saturday - Room 304 - 4:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 129

How I Met Diphto

Diphtheria, a lethal disease caused by the toxigenic strain of Corynebacterium diphtheriae, afflicted Indonesia in December 2017 with 1/10 mortality rates upon 593 national cases. Complicated diagnostic method and ambiguous symptoms were the main obstacles in giving the optimal treatment, according to physicians. Therefore, a fast and convenient novel approach to enhance diagnostic precision is needed to mitigate diphtheria immediately.In regards, our team focuses on developing the diagnostic tool using K-12 chimeric bacteria and green fluorescent protein (GFP) to enable a rapid detection of Diphteria toxin upon binding.This novel technology is claimed to be fast, available, and easy-to-use which sets stepping stones regarding to the establishment of primary diagnostic tool for Diphtheria toxin worldwide. In addition, we aim to prevent future outbreaks using public education to enhance awareness regarding anti-hoax movements and introduce daily probiotic consumption to encounter low usages of probiotic in Indonesia

UiOslo Norway

Location:	Norway	**Track**:	Energy
Region:	Europe	**Presentation**:	Sunday - Room 312 - 2:30 PM
Section:	Overgrad	**Poster**:	Zone 1 - 103

BioSol - A Solar Cell Using a Pigment Producing Bacterium to Catch Sunlight

The increasing stress on the environment demands new innovative technologies to satiate the growing energy needs of our society. The aim of our project is to create a system that can harvest energy from the sun by utilizing genetically-modified Escherichia coli. The E. coli are made to produce lycopene by expressing three enzymes from the extremophile Deinococcus radiodurans. Lycopene, an intermediate in the carotenoid biosynthesis pathway, is a conjugated compound that can be excited by specific wavelengths. By coating the lycopene producing cells in TiO2 we can use them in a dye-sensitized, biogenic, photovoltaic device. The material used for these solar cells would have a significantly lower cost of production compared to current solar panels, and with the addition of other pigments could absorb a wide spectrum of light for the production of electricity. We hope that this system will complement other renewable energy sources in the future energy market.

UIUC Illinois

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Friday - Room 309 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 256

RoundDown: Engineering E. coli to Degrade Glyphosate, a Common Herbicide

Glyphosate (N-(phosphonomethyl)glycine), the active ingredient in the popular herbicide RoundupTM, has been used extensively for over 25 years. Glyphosate has long been thought to degrade in the environment and pose no risk to human health. However, studies have recently shown that it persists longer in soil and the World Health Organization (WHO) classified it as a potential carcinogen in 2015. Given these potential risks, we sought to address the issue of environmental persistence by engineering E. coli to degrade glyphosate. Using Gibson cloning, we expressed glyphosate-degrading genes hph and C-N lyase in NEB 10-beta competent E. coli. Preliminary growth experiments showed engineered E. coli has higher glyphosate tolerance than the wild type. We are developing analytical methods to quantify glyphosate degradation. Our results suggest that glyphosate-degrading microbes may have a role in future glyphosate bioremediation strategies.

ULaval

Location:	Canada	**Track**:	New Application
Region:	North America	**Presentation**:	Saturday - Room 310 - 4:30 PM
Section:	Overgrad	**Poster**:	Zone 2 - 190

A.D.N. : Air Detector for Nucleic Acids

A.D.N., or Air Detector for Nucleic Acids, aims at improving air quality control in environments where pathogens control is critical, such as hospitals and nursing homes. The final product will create an all-in-one and easy-to-use device to collect and detect human viral pathogens in the air. Using synthetic biology tools, called Toehold riboswitches, we can identify genetic sequences that show the presence of pathogenic organisms, such as the poxvirus (chickenpox), the norovirus (gastroenteritis) and the measles virus. Our project includes the in silico design of these tools, the experimental proofs of concept and the resulting device. Using theses results, we will produce computational and experimental tools available to the community that will serve research purposes in the field of synthetic biology. Moreover, it will help further the knowledge on aerial viral transmission and contribute to the implementation of air quality control transmission procedures, thus preventing theses potentially deadly nosocomial infections.

ULaVerne Collab

Location:	United States	**Track**:	Therapeutics
Region:	North America	**Presentation**:	Sunday - Room 313 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 120

A New Addition to the Insulin Vision

Diabetes mellitus is a metabolic disorder characterized by high glucose levels over a prolonged period of time. It affects approximately 371 million people worldwide (WHO, 2014). Current treatments include injections and pumps, but insulin production cost has been ever-increasing due to monopoly companies. The Open Insulin Project's goal is to manufacture cheap insulin and analogues and making the protocol public. We are contributing by synthesizing human proinsulin and 3 novel single chain insulins(SCI) that replace the C-peptide with different novel linkers. Our first SCI contains the native A&B chains (pI 5.50). The second SCI is a long-lasting insulin, with an AsnA21Ala mutation (pI 6.46). The third insulin is a fast-acting insulin, with the LysB28 and ProB29 flipped (pI 5.50). Our goal is to secrete these insulins from the periplasmic membrane of E. coli BL21, purify using nickel purification and TEV protease, and characterize using the Elisa and glucose uptake assay.

UM Macau

Location:	Macao	**Track:**	Environment
Region:	Asia	**Presentation:**	Saturday - Room 304 - 9:30 AM
Section:	Undergrad	**Poster:**	Zone 2 - 204

Self-Activating Nanoparticles Collector E. coli (SANCE)

The project SANCE targets on the nanoparticle pollution, an unneglectable issue facing by coastline cities including Macau. We aim to engineer a controllable nano-/micro-particle collector microorganism. We hypothesize that our modified E.coli bacteria expressing the adhesive(sticky) fusion protein on its cell surface would be able to collect the nano-/micro-particle targets, through which, we will be able to help solving the current issue of excessive suspended solids in Macau wastewater treatment process. Our team also plans to largely engage in public by holding various outreach activities, including local wastewater treatment plant visiting, social survey and interview experts from other universities, university workshop, summer camp engagement and high school lecture. Meanwhile, we plan to collaborate with other iGEMers through symposiums, university visiting and lab work collaborations. Through this project, we aim to achieve a more efficient nano-/micro-particles elimination technique and thereby enhance the awareness of Macau residents in water resource protection.

UNebraska-Lincoln

Location:	United States	**Track:**	Therapeutics
Region:	North America	**Presentation:**	Saturday - Room 306 - 3:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 157

Engineering E. coli to Detect and Neutralize MRSA

Methicillin-Resistant Staphylococcus aureus (MRSA) is a multidrug-resistant bacteria, making it difficult to treat. Almost 120,000 infections of MRSA occurred in 2017, with about 20,000 deaths. Current treatment often uses atypical antibiotics with uncertain effectiveness. Overuse of antibiotics has led to the problem of antibiotic resistance, which begs the advent of a different therapeutic approach. Incorporating Escherichia coli into our solution, our team sought to create a chassis that can detect, move towards, and kill MRSA. Our detection system utilizes AgrC and AgrA system from S. aureus to detect AIP released from MRSA and activate the P2 promoter. The P2 promoter then initiates motility and the killing mechanism. Movement is controlled by the motility gene, cheZ, which initiates movement towards AIP. Killing is accomplished by genes gakA, gakB, and gakC from Lactococcus garvieae with a secretion signal attached, which produces the bacteriocin garvicin KS for extracellular secretion.

UniGE-Geneva

Location:	Switzerland	**Track:**	New Application
Region:	Europe	**Presentation:**	Saturday - Room 304 - 3:30 PM
Section:	Overgrad	**Poster:**	Zone 3 - 230

Fluosphera

The replacement of animal testing by alternative in vitro methods is encouraged by the World Health Organization and the US Food and Drug Administration. However, this is a challenge for laboratories because current in vitro cell cultures poorly reflect the physiological organization of tissues. This has led to poor clinical translation, because drugs appearing efficient in vitro finally fail during in vivo trials. We believe there is an urgent need to improve in vitro drug testing to better simulate the in vivo physiology of animal models. Therefore, we created a cell culture toolbox called 'Fluosphera' (provisional patent filed) that is capable of measuring the effects of drug compounds on a palette of biological activities with physiological relevance. With Fluosphera, we aim to improve in vitro drug testing by reducing the reliance on animal experimentation, as well as increasing the efficiency and accuracy of drug screening.

Unimelb

Location:	Australia	**Track:**	Foundational Advance
Region:	Asia	**Presentation:**	Saturday - Room 313 - 4:30 PM
Section:	Overgrad	**Poster:**	Zone 1 - 86

Cell Surface Glutamate and GABA detectors

We are developing glutamate and GABA bacterial biosensors by modifying the iGluSnFr and iGABASnFr proteins developed by Marvin et al. (2013, 2019). These proteins consist of a domain that binds the target ligand and an associated fluorescent domain that becomes activated upon binding. The original sensors developed by Marvin et al. also contain sequences to facilitate expression on the surface of mammalian cells. We intend to modify these by replacing the eukaryotic localisation signal and transmembrane anchor with bacterial equivalents. To this end we have selected the truncated from of a bacterial Ice Nucleation Protein that acts as both a membrane anchor and a localisation signal.The motivation for producing these biosensors is to produce a proof of concept system for cheaply measuring serum GABA and Glut concentrations in a clinical context, since the ratio of these two biomarkers is diagnostic of early neurological deterioration following a stroke.

UNSW Australia

Location:	Australia	**Track**:	Manufacturing
Region:	Asia	**Presentation**:	Friday - Room Ballroom A - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 39

Self-assembling protein scaffold for next generation Taxol production

Paclitaxel is a chemotherapeutic agent used to treat many solid tumour cancers. It is obtained by debarking the yew tree species (Taxus Baccata), or through semi-synthesis from rare precursors in the tree's needles. Both of these processes are unsustainable and contribute to the expensive production costs.Our project aims to address this in two ways. First, to enhance the rate of product formation by attaching rate-limiting enzymes of Paclitaxel semi-synthesis onto a hexameric protein scaffold called 'Assemblase'. This spatial arrangement co-localises the enzymes, alleviating diffusion-related limitations of enzyme catalysis.The second component applies 'Assemblase' to make the production of Paclitaxel from common analogues commercially viable. This reduces the need to log the yew tree, and lower reagent costs. In addition, the system allows for the recycling of co-products produced between the two pathways. Overall, our project aims to improve upon Paclitaxel manufacturing to meet the demands of the future.

uOttawa

Location:	Canada	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Friday - Room 302 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 94

Rapid, Flexible, and Affordable Yeast Genome Engineering with BioBrickTM Standardization

The BioBrickTM Standard 10 was updated to allow site-directed chromosomal modification in E. coli. This design is incompatible with Saccharomyces cerevisiae. In this project, we develop a library of flexible plasmids that adhere to the Standard and Type IIS Assembly and that allow for the systematic and efficient cloning of a desired gene within target yeast chromosomal loci, while maintaining the plasmid's compatibility with E. coli. Our plasmid library targets the Ade2, His3, Ade4, and Gal4 loci, and is equipped with KanMX, NatMX, Ura3, and His3 yeast-selectable markers as well as RFP to enable colorimetric selection in E. coli. We use our experimental procedure to develop simple protocols to allow individuals with minimal laboratory experience to reproduce and expand our library. Finally, we endeavour to expedite and reduce the cost of cloning by making a DIY Gibson Assembly kit, in which all the required enzymes are harvested in the laboratory.

UPNAvarra Spain

Location:	Spain	**Track:**	Environment
Region:	Europe	**Presentation:**	Saturday - Room 306 - 11:00 AM
Section:	Undergrad	**Poster:**	Zone 1 - 62

Color is the new sensor

Surface and groundwater quality deterioration is currently considered as one of the most alarming environmental problems, with major impacts on nature and human health. Some contaminants often found in potable water are heavy metals and nitrate, whose detection methods are complex, barely sensitive or cost-prohibitive.To solve these problems, our goal is to develop genetically engineered bacterial biosensors capable of quantifying cadmium, copper, mercury and nitrate concentrations in water samples. In each biosensor, the expression of a different chromoprotein is driven by inducible promoters. Hence, the biosensors achieve different color intensities depending on the pollutant concentration, which have been correlated to contamination levels by means of a mathematical study. In practical terms, our project clear the way for cheap pollutant detection kits development, composed of simplistic bacterial recipients where the water is to be poured and a phone App able to estimate the contaminants concentration from pictures of the recipient.

Uppsala Universitet

Location:	Sweden	**Track:**	Manufacturing
Region:	Europe	**Presentation:**	Sunday - Room 310 - 11:00 AM
Section:	Overgrad	**Poster:**	Zone 1 - 35

Biomass Destruction

Lignin is the second most abundant organic polymer on earth. It is heterogeneous, consists of a variety of phenolic groups and is highly branched. Every year the paper industry accumulates approximately 50 Mt of lignin as a waste product, which is immediately combusted. Studies have shown that the potential degradation products and monomers of lignin can be used as building blocks for further applications. This project aims to generate a multi-enzyme system, based on characteristics of wood-decaying fungi, to efficiently process lignin into high-value chemicals. To achieve this, Pichia pastoris is engineered to express horseradish peroxidase (HRP) and aryl-alcohol oxidase (AAO). HRP degrades lignin under consumption of hydrogen peroxide. AAO, in turn, utilises parts of the degradation products to create more hydrogen peroxide, forming a self-sustaining system. Both enzymes are fused with a secretion tag to create a continuous cell factory, where the supernatant contains the desired enzyme mixture.

UPRM

Location:	Puerto Rico	**Track:**	Open
Region:	Latin America	**Presentation:**	Friday - Room Ballroom A - 3:30 PM
Section:	Undergrad	**Poster:**	Zone 2 - 136

SynBio101: Road to Coli CTRL

The initiatives by the iGEM-UPRM team achieved a broader understanding of Synthetic Biology in Puerto Rico. Team efforts' facilitated the introduction of the Synthetic Biology course and laboratory to our campus, being the first in the Caribbean. Pioneering and expanding the knowledge of this discipline, the team interacted with the community spreading awareness on the impact of Synthetic Biology via hands-on workshops. Continuing our journey, high school students across the Island participated in the first Synthetic Biology Summer Camp; where they constructed and presented original prototypes using SBOL and BioBricks. Currently, the team plans general public engagement in the first Synthetic Biology Week on campus through panels and round table discussions. The team's ongoing prototype, Coli.CTRL, would be a redesigned bacteria capable of responding to stimuli and express a user-defined genetic construct. iGEM-UPRM aspires to continue impacting the social, educational, and investigative sectors of Puerto Rico within Synthetic Biology.

US AFRL CarrollHS

Location:	United States	**Track:**	High School
Region:	North America	**Presentation:**	Friday - Room 210 - 10:00 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 13

Engineering a Cell-Free Hexavalent Chromium Detection System

As an effective anti-corrosive agent, hexavalent chromium is incorporated into many different products, including aircraft and automobiles. During maintenance of aircraft, hexavalent chromium can be released causing severe environmental and health impacts. With increasing regulations, there is a critical need for a cheap, quick and effective detection test. Through our human practices, potential users were reticent about using engineered live microbes and since hexavalent chromium is toxic to bacteria, we set out to develop a cell-free system which includes the repressor, ChrB, that binds to the chromium promoter ChrP. In the presence of hexavalent chromium, ChrB is released from ChrP, allowing for the expression of a reporter gene. We explore the use of two different reporter genes: a green fluorescent protein, and a bacterial flavin-containing monooxygenase, an enzyme that results in visible indigo production. Therefore, in the presence of hexavalent chromium, the system will produce a visible color change.

USAFA

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Friday - Room 306 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 215

pFASt Detection System: Using Synthetic Biology to Detect PFAS Contamination in Water

Per- and polyfluoroalkyl substances (PFAS) are a class of synthetic compounds used industrially for a wide variety of applications. Two PFAS chemicals, perfluorooctanoic acid (PFOA) and perfluorosulfanoic acid (PFOS), persist in the environment and are linked to cancer and birth defects. The accumulation of these compounds has been shown to cause cell-membrane disruption, oxidative stress, and DNA damage, but long term effects on humans are not completely understood. Technologies for testing PFAS levels in water are currently limited, costly, and time consuming.The USAFA iGEM team is genetically engineering bacteria to detect PFOA and PFOS, with the end goal of designing a bacterial biosensor that can be incorporated into a field test highly accessible to the Air Force.

USP SaoCarlos-Brazil

Location:	Brazil	**Track**:	Environment
Region:	Latin America	**Presentation**:	Sunday - Room 302 - 2:30 PM
Section:	Overgrad	**Poster**:	Zone 3 - 253

Iara - biofilm formation and metal capture

Mercury is a heavy metal that causes environmental and health damage when carelessly disposed. Industries and mining companies frequently discard mercury into nature along with its waste. In the past 4 years, Brazil has suffered two disasters associated with mining dams (Mariana-MG and Brumadinho-MG). The metal-contaminated mud released from the dams reached neighboring rivers, causing severe social and health impact on the local population. This project aims to create a mercury collecting water biofilter using genetically engineered Escherichia coli which express five proteins: a chimera, three secretion machinery units and a bacterial biofilm inducer. Furthermore, the biofilm will grow in green coconut fiber, a cheap abundant material that facilitates the removal of bacteria from the environment. This fiber is already used as a filter for other metals, contributing to filtering efficiency. Consequently, besides allowing mercury's removal from water, our project grants the reuse of an abundant brazilian product.

USP-Brazil

Location:	Brazil	**Track**:	Foundational Advance
Region:	Latin America	**Presentation**:	Sunday - Room 309 - 5:30 PM
Section:	Overgrad	**Poster**:	Zone 1 - 88

genSwitch

Bioproduction, a industrial process that generates useful products through microorganisms, performed in bioreactors and occuring in two main steps: upstream (induction and production of bacterial metabolites) and downstream (isolation and purification). The most common inductor used in bioproduction are expensive chemical compounds (IPTG and arabinose) that lacks in control of what and how much metabolite can be produced. In this way, our goal is to built a genetic circuit that can switch between two different states of activation with just a single input of blue led light and to compare the efficiency between chemical and light inductors by seeing strength and lack. The circuit was built in E.coli and works based on inhibition handles and recombinases, inverting the promoter region according to the presence and absence of the same blue light input, as output fluorescent proteins are used. The project allows a more practical, controlled and economical bioproduction pathway.

USTC

Location:	China	**Track**:	Environment
Region:	Asia	**Presentation**:	Friday - Room 310 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 135

microROAD

Dressed in colorful clothes, humans have been enjoying the benefit of abundant dyes. Among them, azo dyes are the most widely used ones. However, many types of azo dyes are quite difficult to degrade. What`s worse, about 10-15% of the azo dyes in waste water is discharged without treatment. Thus, the degradation of azo dyes has become an urgent problem.At present, physical and chemical treatments have been applied to deal with the azo dyes in waste water. Both of the two ways are suffering from the disadvantages of low decolourization ratio, high cost and additional pollution.Our project focuses on ulteriorly improving the decolourization ability of Shewanella oneidensis by introducing NAT enzyme to help resist the byproduct toxicity and overexpressing electron transfer proteins. Also, we add HXK enzyme into the bacteria to make it possible for it to utilize glucose, which can reduce the cost.

USTC-Software

Location:	China	**Track**:	Software
Region:	Asia	**Presentation**:	Friday - Room 310 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 81

Foresyn: Making Reliable Customized Flux Analysis With Ease

The FBA and its further study have been proved useful to make inference about the change of metabolite flux given the objective function so that the factory and laboratory can make targeted improvements to their experiment to increase productivity. There already exist some tools to do FBA, but all with shortcomings: they can't show an intuitionistic graph of the dominant metabolite in the pathway related to the object, they can't compare the modified model with the original one and they can't share with others as well.Foresyn is a user-friendly platform that solved the issues. The neoteric workflow management based on customized database allows users to build their models for flux analysis, get visualized output and easily share with others.

UTArlingtonTexasUSA

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Friday - Room Ballroom A - 5:00 PM
Section:	Overgrad	**Poster**:	Zone 1 - 106

Investigating the Biosensing Capabilities of Microbial Fuel Cells

Microbial fuel cells (MFCs) are electrochemical systems that rely on the reduction potential of organic matter by respiring microorganisms to produce electricity. Our research group was inspired by the 2007 Glasgow team's use of the pyocyanin mediator and Xylr protein to detect BTEX pollutants (xylene, toluene and benzene) with an E- coli based MFC. The reduction-oxidation of pyocyanin can be harnessed by the cells to deposit electrons; If the cells were to respond to a pollutant by producing pyocyanin, we can observe the change in current as an indication of the presence of the pollutant. Our team aims to investigate this sensing system by making the bacteria produce fluorescent proteins in response to the presence of these pollutants. Utilizing change in fluorescence to correlate concentrations. This project will expand the tests done by the Glasgow team to continuously monitor if the mediator and sensor producing genes have retained their function.

UZurich

Location:	Switzerland	**Track:**	New Application
Region:	Europe	**Presentation:**	Friday - Room 304 - 4:30 PM
Section:	Overgrad	**Poster:**	Zone 1 - 2

Introducing a novel system to compartmentalize bacteria

We are constructing a large protein cage within bacteria that can be used to confine and compartmentalize biochemical reactions with potential toxic intermediate products.Bacterial microcompartments (BMC's) are currently the main tool for compartmentalizing bacterial cells and biochemical reactions.Our protein cage could overcome the current limitations of BMC's, which are very small in size and can only hold up to two different enzyme types so far.To produce this protein cage, we are taking a minimal component approach to replicate a natural phage-bacteria interaction.The phage we are working with encapsulates its DNA into a protein cage upon infection of the host bacteria. By using multiple approaches such as microscopy, sequence analysis and in-vitro essays we try to assess which proteins are necessary to form the protein cage.We then co-express promising candidate genes in the host and evaluate the results via microscopy.

Victoria Wellington

Location:	New Zealand	**Track:**	Energy
Region:	Asia	**Presentation:**	Sunday - Room 312 - 3:00 PM
Section:	Overgrad	**Poster:**	Zone 1 - 83

Glycerol based enzymatic fuel cell

The rise of electric vehicles has created a large demand for batteries.And, with the recent push to declare a climate emergency, it seems that this problem will not be solved by building greater quantities of environment-damaging rare metal batteries (eg. lithium-ion). This iGEM project attempts to solve this issue by building an enzymatic fuel cell to use the abundant, industrial by-product, glycerol to efficiently create clean energy. A three enzyme pathway and the mild radical oxidant TEMPO-NH2 are used to carry out the complete oxidation of glycerol. The three enzymes were manufactured via E. Coli and 6-His tag purification. Finally, the kinetics data is reported with either spectro-photometric measurements of NADH or quantitative H-NMR.

Vilnius-Lithuania

Location:	Lithuania	**Track**:	Foundational Advance
Region:	Europe	**Presentation**:	Friday - Room 302 - 9:00 AM
Section:	Undergrad	**Poster**:	Zone 2 - 167

Colight: Novel Optogenetic Tools For Modular Bacterial Control

Synthetic biology aims to design cellular functions rationally. This goal often requires a signal input and for that chemical inducers are mostly used. However, chemical effectors are not optimal as they might cross-react with other pathways, be toxic, work with a delay, and are usually irreversible. In contrast, light-inducible systems are minimally invasive; also, the signal is delivered quickly and in high resolution. These features open new possibilities in research on how protein expression dynamics affect the operation of a synthetic circuit.To realize the potential of optogenetics in bacteria, we have created a three-level light-controlled system for dynamic bacterial control. It includes (1) a repressor based tool for tight transcriptional control, (2) a way to control steady-state protein levels by light-activated degradation, (3) a framework to maintain different plasmid copy numbers in bacterial growth and production stages.Thus Colight provides an innovative approach for real-time bacterial control.

Virginia

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Friday - Room 306 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 184

Transfoam

The primary objective of the project is to create an industrially-comparable method of producing PHA, a biodegradable plastic, from Styrofoam (polystyrene) waste. We hypothesize that a genetically modifying E. coli can convert styrene (monomerized polystyrene) to P3HB, a specific PHA, with just two plasmids. Our device will aim to reduce the 30% of plastic waste volume accounted for by polystyrene while simultaneously enabling cost-effective production of PHA.

VIT Vellore

Location:	India	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Friday - Room 312 - 2:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 119

ARM'D UP: Antibiotic Resistance Mechanism Disruption Using Phages

We have designed a genetic circuit to detect and specifically destroy multiple target bacterial species/strains containing antibiotic resistance gene using bacteriophage.Our genetic circuit employs two parts. The first part is the antisense RNA to determine the presence of antibiotic resistance gene. The second part is the J protein hopping mechanism.The antisense RNA is used to identify antibiotic resistant bacteria. On detection, a switch to the lytic life cycle of virus results in the disruption of the bacteria and release of more phages. In the absence of resistance gene, lysogenic state is maintained.Normally, a single virus can target a specific bacteria. J protein has been identified to play a crucial role in recognition of its bacterial target. Our system employs alternate promoters controlling the expression of multiple J protein. This allows the virus to have multiple bacterial targets.

Wageningen UR

Location:	Netherlands	**Track**:	Food and Nutrition
Region:	Europe	**Presentation**:	Sunday - Room 210 - 5:00 PM
Section:	Overgrad	**Poster**:	Zone 2 - 153

Xylencer - silencing Xylella fastidiosa

A devastating plant-pathogen, Xylella fastidiosa, is spreading through the Mediterranean. This pathogen is wiping out economically important crops, including olives and grapevine, with no effective cure found yet. Currently, the containment methods for this disease are pre-emptively burning trees and using high doses of pesticides. Our team, Xylencer, develops an effective solution for this disease by using bacteriophage therapy for X. fastidiosa. To overcome current limitations, including UV degradation of bacteriophages, we design a protective carrier bacterium that produces bacteriophages upon sensing X. fastidiosa. Bacteriophages will lyse the bacteria, while simultaneously triggering a plant immune response with specific peptides, forming an alliance between plant and bacteriophage. In order to have the bacteriophage spread to all infected plants, we mimic X. fastidiosa's spread by fusing chitin-binding proteins to the bacteriophage capsid, facilitating their spread by insects. Using our modular approach Xylencer, we believe we can eradicate X. fastidiosa.

Warwick

Location:	United Kingdom	**Track**:	Environment
Region:	Europe	**Presentation**:	Sunday - Room 210 - 10:00 AM
Section:	Undergrad	**Poster**:	Zone 1 - 99

Infatuation

As the poet Thomas Gray once said, 'ignorance is bliss'. In this case, ignorance has created a problem. A big problem. Fatbergs.These large congealed masses made of fat, oil, grease and non-biodegradable materials like wet wipes are beginning to wreck infrastructural havoc, causing thousands of sewer blockages, which the UK government spend millions clearing each year. We - the Warwick iGEM team - have begun to work towards a biological solution to this growing problem. Outside of the lab, our team have educated the public about the consequences of their everyday actions and have considered the ethical issues and legislation surrounding our research. Additionally, we've collaborated with various institutions; obtaining a fatberg sample from United Utilities in Liverpool and fatberg DNA from Aberystwyth University. We aim to characterise candidate lipases for the breakdown of these greasy nightmares, with the hope of keeping our sewers and our lives flowing smoothly.

Washington

Location:	United States	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Saturday - Room 313 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 1 - 85

Immunosense: Detecting small molecules using a chemically-induced dimerization system

Although biosensors are commonly used to detect many different molecules of interest, they cannot effectively detect small hydrophobic molecules in biological systems. We propose combining chemically induced dimerization (CID), in which two proteins dimerize only in the presence of a ligand, with a traditional luciferase assay to create a biosensor that luminesces when the desired molecule is introduced. Using molecule-specific nanobodies, we can design the two CID binders to attach to a wide variety of small molecules, even those that are challenging for conventional biosensors to detect. Through its specificity and ability to bind to small or hydrophobic molecules, the CID system overcomes problems that other biosensors face. As a proof-of-concept, we implemented an in vivo CID biosensor to detect the presence of cannabidiol. With the nanobody CID system, we hope to introduce a novel biosensor that can detect a variety of important small molecules across research, biotechnology, and medicine.

Waterloo

Location:	Canada	**Track**:	Environment
Region:	North America	**Presentation**:	Saturday - Room 306 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 218

Rooting for symbiosis: Engineering herbicide tolerance in rhizobia

Despite playing an important role in protecting crops, herbicides can negatively impact the rhizosphere by interfering with root nodule formation. Rhizobia are soil bacteria that form beneficial relationships with agriculturally important legumes. These microorganisms form root nodules and fix nitrogen gas into ammonia, which plants need to grow.Farmers using herbicides that interfere with biological nitrogen fixation need to apply more nitrogen fertilizers. The runoff from these fertilizers causes nutrient pollution. Therefore, we aim to minimize the use of nitrogen fertilizers. To do this, we are engineeringBradyrhizobium diazoefficiens USDA110 to have the ability to form root nodules with soybeans in the presence of the herbicide linuron. We hope to confer herbicide tolerance by giving B. diazoefficiens the ability to biologically transform the herbicide and dampen its toxicity. Agriculture is a large component of our community. This project hopes to provide constructive synthetic biology solutions that support current agricultural practices.

Western Canada

Location:	Canada	**Track**:	Environment
Region:	North America	**Presentation**:	Friday - Room 310 - 3:30 PM
Section:	Overgrad	**Poster**:	Zone 2 - 176

Self-assembling catalytic Escherichia coli biofilms for removal of emerging contaminants from wastewater

The presence of newly identified or emerging contaminants (ECs) in our bodies of water is of growing concern for the health and safety of humans and the environment. These undesirable organic compounds range from endocrine disruptors and pharmaceuticals, to personal care products, pesticides, and fertilizers. The existing wastewater treatment plants lack adequate infrastructure for removing these pollutants. In this project, we employ a synthetic biology approach to develop a self-assembling catalytic bacterial biofilm capable of degrading ECs. The bacteria were engineered to express fusion proteins that assemble into fibrous structures extracellularly and enable greater accessibility of the enzyme substrate. This platform for the degradation of emerging contaminants is a versatile and promising avenue for the removal of these toxic compounds from wastewater.

Westminster UK

Location:	United Kingdom	**Track:**	Energy
Region:	Europe	**Presentation:**	Sunday - Room 313 - 12:00 PM
Section:	Overgrad	**Poster:**	Zone 2 - 128

Operation Exo-electrogen

For more than a century, burning fossil fuels has generated most of the energy required to propel our cars, power our businesses, and keep the lights on in our homes. Even today, highly polluting forms of energy such as oil, coal and gas provide for about 80% of our energy needs. In order to reduce our dependence on these unsustainable forms of energy, our project focused on improving the efficiency of microbial fuel cells (MFCs) - battery-like devices that utilise energy from exo-electrogenic bacteria. We did this by making contributions to the research of the Mtr pathway of the exo-electrogenic bacterium Shewanella oneidensis, while attempting to improve its performance by variably expressing the pathway components inside the bacterium and adjusting its functioning in aerobic environments. We also did modeling and laboratory research in collaborations on further applications of MFCs involving the breakdown of the highly prominent plastic polymer, PET.

WHU-China

Location:	China	**Track:**	New Application
Region:	Asia	**Presentation:**	Friday - Room 304 - 5:00 PM
Section:	Undergrad	**Poster:**	Zone 1 - 54

SilKeep

This year, our team applied synthetic biology to the field of restoration of cultural relics. The aim of our project is to reinforce one piece of extremely precious silk relic, called 'Plain Gauze Garment (□□□□)'.We would like to use BC (Bacteria Cellulose) secreted by engineered E.coli to reinforce the fragile area of silk relics. And to realize the accurate reinforcement, we design a light system which is cooperatively used with our hardware to reinforce the areas varying different degrees of fragility in irregular shape.Besides, we plan to assemble AMPs(anti-microbial peptides) and AOPs(anti-oxidant peptides) onto BC via biotin-streptomycin combination and CBD(cellulose binding domain) to realize a functional platform. Our project is meaningful for cultural inheritance owing to reduction of the protection cost and keeping the silk relics in a good condition.

William and Mary

Location:	United States	**Track**:	Foundational Advance
Region:	North America	**Presentation**:	Sunday - Room 309 - 4:30 PM
Section:	Undergrad	**Poster**:	Zone 2 - 161

Smartfilms: EngineeredBiofilms as Living Materials

Our iGEM project aims to create a toolkit for the precise, controlled design of living biomaterials. Of the many forms of living materials, we have chosen bacterial biofilms due to their ubiquity and outstanding bioengineering potential. Biofilm formation, although frequently associated with deleterious effects, also equips bacteria with emergent properties such as increased resilience, complex signaling, self-repair, and division of labor. Our project harnesses these properties to repurpose biofilms as robust, spatially controlled, patterned, and responsive biomaterials. For robustness, we engineered a library of biofilm-strengthening adhesins, and investigated naturally biofilm-forming bacterial species. To adhere biofilms with precise spatiotemporal control, we incorporated both optogenetic and chemical induction methods. To pattern biomaterials once placed, we utilized the distance-dependent diffusion of quorum signaling molecules and generated Turing patterns that are informed by mathematical modeling. Our biomaterials have immediate applications in wound healing, water and waste treatment, and the creation of next-generation biosensors.

WLC-Milwaukee

Location:	United States	**Track**:	Environment
Region:	North America	**Presentation**:	Sunday - Room 302 - 3:00 PM
Section:	Undergrad	**Poster**:	Zone 3 - 267

Lead Scentsor

As seen in Flint, Michigan, water supplies can be contaminated by aging infrastructure. Our team is based in Milwaukee, Wisconsin which also has a lead problem. Our team is developing a method to identify lead in water through our sense of smell. By putting the gene for an enzyme that produces the wintergreen scent under the control of a lead-inducible promoter and placing this construct in E. coli, we have created an engineered organism that will detect lead by providing a scent. By putting this engineered E. coli in a capsule which will dissolve in water, any individual can collect a water sample and use this test. The E. coli is safe and this kit is environmentally friendly due to the lack of any plastic parts. This will allow people to test any sample of water they suspect is contaminated by lead and seek an appropriate remedy.

Worldshaper-Shanghai

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Sunday - Room 309 - 10:00 AM
Section:	High School	**Poster**:	HS Zone 2 - HS 49

Easy (blood) uric-acid monitering system

Gout, generally induced by monosodium urate crystal deposition, is one of the incurable diseases for human now. The inefficiency faced by gout patients brought by regular blood uric acid test in hospital mainly attributes to the long waiting time for the results. Thus the ultimate goal of our project is to construct a portable, use-friendly blood test device that can be used at home. Briefly, our device was designed based on a uric-acid-responsive regulatory system, named as HucR regulatory system, with mCherry as the reporter protein. Using cellulose acetate membrane as the carrier, the HucR regulatory system was worked as expected. The results shown that the concentration of uric acid is inversely correlated with the intensity of the red fluorescence. We believe this project would open up a new horizons as a pioneer of simple-to-use home diagnostic test kit.

Worldshaper-Wuhan

Location:	China	**Track**:	High School
Region:	Asia	**Presentation**:	Sunday - Room 210 - 3:00 PM
Section:	High School	**Poster**:	HS Zone 2 - HS 72

As it fades away，an arsenic treatment system in water

Arsenic (As), a metalloid, is known as a carcinogen, which affects the health of millions of people worldwide. Conventional treatments of arsenic are mostly ineffective and have some limits like high cost and secondary contamination. Bioremediation has been regarded as a novel and environmental-friendly way for As removal. In this project, we intend to develop genetically engineered bacteria for As treatment based on bioremediation by using synthetic biology approaches.We aim to build engineered bacteria which consists of mainly two parts: arsenic-responsive reporter system and a bioabsorbent system with two different types. One is a surface-displayed system for the overexpression of an arsenic-chelating metallothionein (fMT), and the other is a phytochelatin synthase (PCS) which can produce phytochelatin for the removal of arsenic in the cell.For the future, we expect we can establish a promising and economical method to solve the problem of As pollution.

Worldshaper-XSHS

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Sunday - Room 312 - 4:30 PM
Section:	High School	**Poster:**	HS Zone 1 - HS 11

Biological degradation system of Azo chemicals

Printing and dyeing industry is one of the most important industries of our hometown, Hangzhou. However, the producing wastewater containing Azo dyes has become one of the major sources of pollution, which is not only destructive to local ecosystem but also toxic and harmful to human health. In this project, we aim to construct engineered E. coli-based system to treat wastewater containing Azo dyes. Two azoreductases (Azr, AzoR) and two laccases (CotA and ScLac) were transformed into E. coli for decolorization and detoxification of azo dyes specifically. Our results show that the laccases have very good performance in decolorization of Reactive Red. Thus, the laccase might be a promising candidate for the biological treatment of industrial dye wastewaters. We hope that through our efforts, we can provide a convenient, practical, clean and economical method to degrade azo dyes and improve the water quality environment of our hometown.

Wroclaw

Location:	Poland	**Track:**	Environment
Region:	Europe	**Presentation:**	Sunday - Room 302 - 3:30 PM
Section:	Overgrad	**Poster:**	Zone 2 - 148

Engineering microorganisms to fight for better quality of air at home

The aim of the project was to develop biofilters based on eco-friendy polymers, designed for purifying air from heavy metals. Microorganism used in the research was Yarrowia lipolytica, a popular non-conventional yeast used in bioremediation, due to its ability to absorb high concentrations of heavy metals. The goal was to create a strain expressing genes responsible for the synthesis of lycopene and γ-decalactone. The genes will be placed under the control of metal induced promoters and cloned into the yeast to generate red color and peachy smell, once the concentration of heavy metals reaches high level. Out of six analyzed genes, two were expressed when cells were exposed to heavy metals. The promoters of these genes were identified and characterized, followed by their application in the pathway of lycopene and γ-decalactone production. Currently, application of Y. lipolytica cells with inducible lycopene biosynthesis pathway trapped in eco-friendy polymers are under investigation.

XHD-WS-Wuhan-A

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 312 - 11:30 AM
Section:	High School	**Poster:**	HS Zone 2 - HS 68

miRNA-based Detector For Gastric Cancer Early Diagnosis and Future Therapy

Gastric cancer (GC), a malignant epithelial cancer disease, is associated with a high global incidence of mortality. There are only limited diagnostic methods for early detection of GC. Thus, there is an urgent search for new, non-invasive, biomarkers to allow early detection of GC. MicroRNAs (miRNAs) are small (~22 bp) nucleic acids that function by regulating the expression of target genes. Previous studies indicated miRNAs can serve as a potential source for biomarkers for detection of human malignancies, including GC. We chose four miRNAs (miR-17, miR-21, miR-196a and miR-148a) expressed in patients serum of different stages of GC and established four miRNA sensors to detect these miRNAs in GC cells. Our results suggested the sensor of miR-196a and miR-148a is a better monitor to detect miRNA expression in GC cells than others. Our project may provide a new non-invasive method to diagnosis gastric cancer in early stage in the future.

XHD-WS-Wuhan-B

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Friday - Room 210 - 9:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 18

Pb-Collector: Heavy metal lead removal from contaminated waters

Lead contamination is one of the most severe heavy metal pollutions in the world, due to its widespread use and incorrect disposal to environment. Accumulation of lead can cause lead poisoning to all living organisms. In this project, we aim to design and construct a E.coli-based system to sense and bioabsorb the lead to provide a promising way for lead pollution treatment. We tried to construct the lead bioremediation system combined with a lead-responsive reporter system. The lead bioremediation system includes two metal-binding proteins, a metallothionein and a synthetic phytochelatin expressed by surface-display system. For the future, we hope through our effort, we can finally establish a reliable, low cost method to solve the problem of lead pollution in serious contamination areas.

Xiamen City

Location:	China	**Track:**	High School
Region:	Asia	**Presentation:**	Saturday - Room 313 - 9:30 AM
Section:	High School	**Poster:**	HS Zone 1 - HS 42

MPD degrader: create a mirobe to degrade contaminant m-phenylenediamine

M-Phenylenediamine (MPD) is an important raw material of organic synthesis, but it is also a common chemical pollutant which causes toxicity to aquatic animals and humans. Until now, people do not have a cost effective and convenient way to degrade MPD. Here we use three starting microbial strains with adaptive evolution to degrade MPD. The first two strans are Escherichia coli MG1655 and the strain with laccase expression plasmid which is reported degrading polyphenols, and the other is an unknown strain isolated from contaminated sludge. Under the increasing supplement of MPD in their culture media, the adaptive evolution may happen during generations. Our results demonstrate the lasccase overexpression E. coli strans has the ability to degrade MPD. We also inditified the unknown strain is Bacillus aryabhattai B8W22, and it is able to degrade the analogues of MPD. And the adaptive evolution to decompose MPD may achieve in the future study.

XJTLU-CHINA

Location:	China	**Track:**	Therapeutics
Region:	Asia	**Presentation:**	Sunday - Room 304 - 4:30 PM
Section:	Undergrad	**Poster:**	Zone 1 - 93

exoCar in the brain

exoCar is designed to apply mRNA-contained exosomes to alleviate the symptoms of neurodegenerative diseases, since the early treatments are limited due to the difficulty in diagnosis of specific clinical subgroups. At the early stage of neurodegenerative disease, the overstimulation-led neuronal injury, or excitatoxicity has an high risk to induce degeneration of neurons. In the extracellular matrix of CNS, the uncontrolled over-high concentration of glutamate, as a primary excitatory amino acid neurotransmitter, is common in the cases of neurodegenerative diseases. Thus, we chose an mRNA which codes the glutamate transporter that generally expressed on the surface of mammals' glial cells, the Excitatory Amino Acid Transporter 2 (EAAT2), to be enclosed in exosomes, which are designed to carry the therapeutic 'cargo' to pass the BBB. The EAAT2 will be translated in the glial cells, and increase the efficiency of glutamate clearance as a useful method in the early treatment of neurodegenerative diseases.

XJTU-CHINA

Location:	China	**Track**:	New Application
Region:	Asia	**Presentation**:	Sunday - Room 310 - 9:30 AM
Section:	Undergrad	**Poster**:	Zone 2 - 186

Bacterial Fragrance Generator

Nowadays an increasing number of people worldwide are suffering various sleep-related problems. The linalool and limonene, which exhibit pleasant aromas, have excellent performance on solving them. Our project focuses on the selective production of linalool and limonene, by construction, verification and modeling of the precursor generation system and light control system respectively. Firstly, glucose was converted to the shared precursor of these two molecules by a precursor-producing plasmid. Secondly, the thermosensitive protein CI and red-light-controlled switching elements in the fragrance-producing plasmid enabled the conversion of the precursor to limonene and linalool alternatively, leading to the synthesis of linalool at night for a sound sleep, while the synthesis of limonene in the morning to remove sleepy mind. Additionally, a primary hardware has been built to realize our design with the prevention the bacterial leakage and nutrients supplementation, coupled with another software for device control.

XMU-China

Location:	China	**Track**:	Open
Region:	Asia	**Presentation**:	Sunday - Room 302 - 5:30 PM
Section:	Undergrad	**Poster**:	Zone 3 - 259

Re_Gone with the Wind

The far-reaching novel ‘Gone with the Wind’ depicts the progress of change about a couple from loving each other to hurting each other, which coincidentally contains the four relationships between the bacteria we’d like to show this year.We split the ‘cooperative’ genes--cenA, cex and bgl1A, which are capable of degrading cellulose, and respectively transform them into two kinds of bacteria so as to help these bacteria survive better under the cellulose situation.At the same time, the two types of bacteria carry different ‘aggressive’ genes--Colicin E1 and Colicin N, who would start the period of expressing proteins due to the induction caused by different inducers and consequently harm each other.By designing genetic circuit of different relationships, the ultimate aim of us is to find the possible applications for synthetic biology in sociology.

YAU-China

Location:	China	**Track**:	Therapeutics
Region:	Asia	**Presentation**:	Sunday - Room 306 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 1 - 14

Biodestroyer of biofilm(Bob)

Bacterial biofilms present significant medical challenges. A key component of biofilm formation in the opportunistic human pathogen Pseudomonas aeruginosa is the biosynthesis of the exopolysaccharides Pel and Psl, which are involved in the formation and maintenance of the structural biofilm scaffold and protection against antimicrobials and host defenses.So, we used synthetic biology methods to overexpress the hydrolyzing enzyme that decomposes the corresponding extracelluar polysaccharide in engineering bacteria to destroy the wild type P. aeruginosa biofilm. Since the extracellular polysaccharide hydrolase is an instracellular enzyme and can't be secreted into the extracellular environment, this project designed two protocols to induce the engineering bacteria to cleave, thereby releasing the extracellular polysaccharide hydroalase into the extracellular environment and destroying the wild biofilm.We hope to solve problems of antibiotic resistance caused by biofilm formation of P. aeruginosa in clinical treatment , and provide a new idea for eradication of chronic bacteria infection.

ZJU-China

Location:	China	**Track**:	Diagnostics
Region:	Asia	**Presentation**:	Sunday - Room 210 - 12:00 PM
Section:	Undergrad	**Poster**:	Zone 2 - 130

PaDetector, a household device for HPV preliminary screening

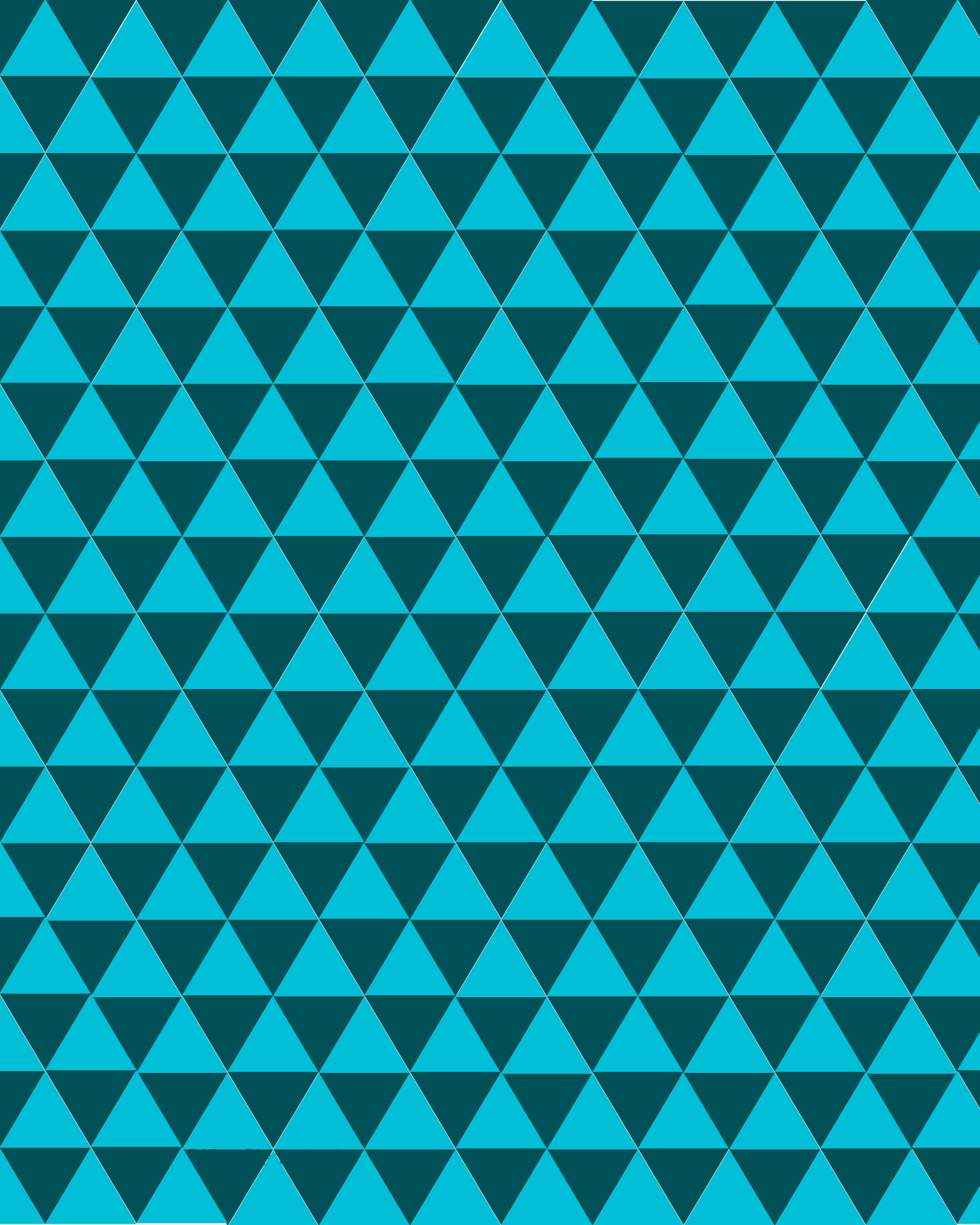
The incidence and mortality of cervical cancer in China has continued to rise. To solve the problem, our team designed and manufactured a set of household HPV detector for HPV early screening. Our detector will use female menstrual blood as teat sample and support two detection methods. The first method is based on CRISPR/Cas system. After rupturing the cervical epithelial cells in menstrual blood, we amplified the target with RPA, then identified it with Cas12a protein. This method is highly specific and can be used for HPV typing. However, in HPV screening, the key is to detect multiple HPV subtypes simultaneously. Therefore, to implement multi-channel detection, we designed another method. It uses Exo□ to assist signal amplification and uses hybridization chain reaction to further amplify the signal. Both methods report the result using test paper. We have also designed three versions of PaDetector to better meet user needs.

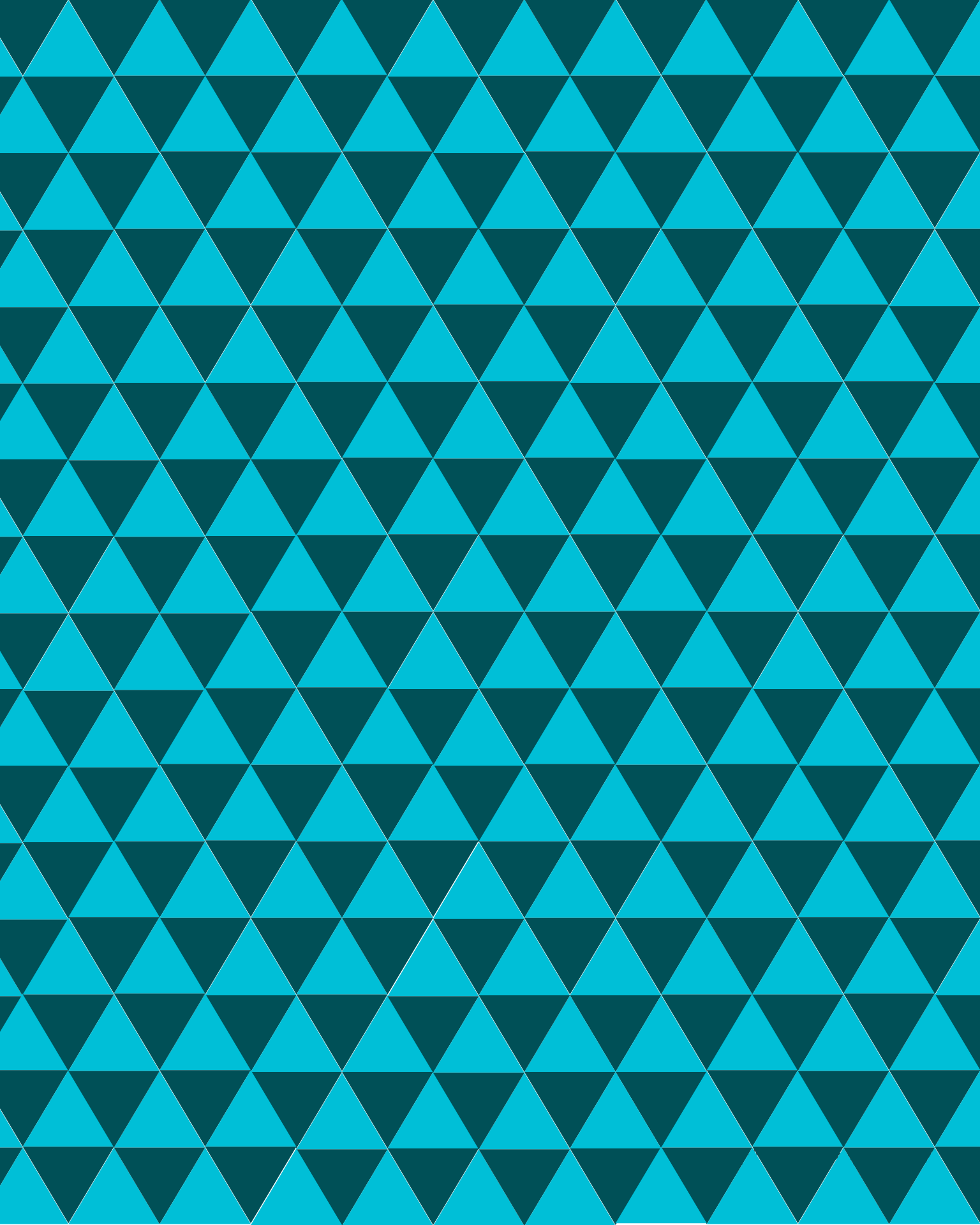
ZJUT-China

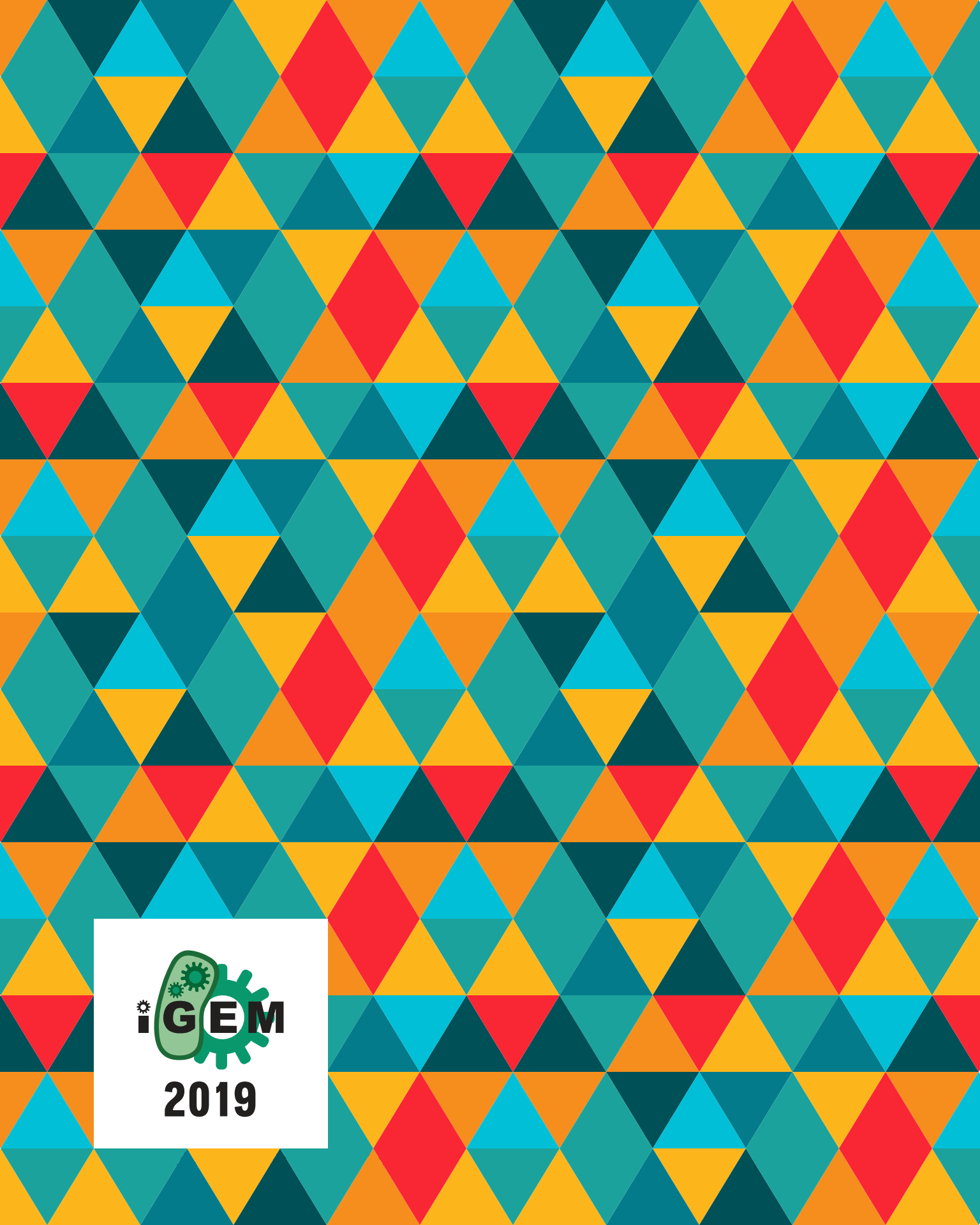
Location:	China	**Track:**	Environment
Region:	Asia	**Presentation:**	Sunday - Room 312 - 10:00 AM
Section:	Undergrad	**Poster:**	Zone 3 - 244

HCHO-Scavenger：A genetically engineered bacteria machine as a scavenger for formaldehyde cleavage

Formaldehyde is a serious threat to human health while it almost exists everywhere especially in newly decorated rooms. This year, our team focus on the degradation of formaldehyde using E. coli. Our genetically engineered bacteria contain three parts: the degradation device，the indication device and the photolysis device. The degradation device acting as the core turns formaldehyde into carbon dioxide with several protein. At the same time, the indication device shows users if the concentration of formaldehyde is safe to live. When the concentration is higher than a threshold value, the medium gives a blue color, otherwise it appears orange. In consideration ofbiosafety, we integrate a photolysis system which expresses lysin protein when exposed under blue light, thus our HCHO-scavenger works in the dark. The lysed bacteria can be recycled in the end.






iGEM
2019