School of Life Sciences
The Chinese University of Hong Kong

2013 iGEM Asia Regional Jamboree Handbook

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1. Message from the organizing committee

A very warm welcome to all of you coming to the Chinese University of Hong Kong (CUHK)!

Thank you for coming to share your synthetic biology ideas with all of us. The main theme of our Jamboree this year is Synthetic Biology and Our Society. We believe our inventions will all make our planet earth a better place to live; this jamboree would like to reduce waste production and minimize our carbon footprint as far as possible. The next few days will be full of exciting presentations, stimulating conversations, well-deserved awards, and most of all, a lot of fun.

The following information will guide you through the whole Regional Jamboree event from what to expect at the Friday night practice all the way up to the Awards ceremony on Sunday. Please read through this whole guide! It contains useful instructions and information that will ensure your Regional Jamboree experience going on as smooth as possible.

This year, all ceremonies and presentations are arranged inside the Yasumoto International Academic Park (YIA) on CUHK campus. We have invited the Agriculture, Fisheries, and Conservation Department of the HKSAR Government to show case the local laws on genetically modified organisms with their poster presentations, together there are a few other exhibitions. The social events this year are arranged in the S. H. Ho College Dining Hall (Ho Sin Hang Hall) with a high table dinner and our Mascot Green (Fashion) Show. A special performance from Shaw Band will also be arranged for you to enjoy and bring all the good memories home.

Wishing you all best of luck, and looking forward to seeing most of you in Boston this year.

2. Jamboree Schedule

2.1 Check-in and Registration:

Friday 4:00 pm – 9 pm
Saturday 8:00 am – 12:00 noon
Please do your team registration at the main entrance of the YIA Park
At registration, the **team leader** will pick up your team bags containing team member badges, participation certificates, registration packets, meal tickets, and other important and useful information.

2.2 Rehearsal:

Friday 5:30 pm – 9:30 pm
We have six lecture theatres and 3 classrooms reserved for you to do your rehearsal. Each presentation will last

for 20 minutes, with 5 minutes of questions and answers, and 5 minutes to switch to the next team. You should have booked the rehearsal schedule at this link here: http://www.diyweb.me/igemasia/. *Pizza and soft drinks will be provided from 6 pm to 9 pm at the food counter on the first come first serve basis.*

2.3 Opening ceremony:

Breakfast will be provided on Oct 5, 2013, Saturday morning from 8 am. *The opening ceremony starts at 9 am* sharp. Our head judges from Asia (King Chow) and the Head Quarter (Kim de Mora) will explain the games to you, together with our special guest of honor Prof. Joseph Sung, President and Vice-Chancellor of CUHK, to officiate the opening of 2013 iGEM Asia Regional Jamboree!

2.4 Presentations:

There are 6 concurrent sessions this year, the first presentations start at 9:30 am sharp. In an effort to capture all of the hard work that teams have put into their iGEM projects, we ask that each team gives us a copy of your presentation and a copy of your poster in pdf files. Please submit 15 MINUTES BEFORE THE START OF EACH SESSION. Bring your laptop with the files on it to the front and the iGEM staff member will transfer your presentation and poster to a USB key that they will have with them. **Please make sure to do this in the 15 minutes prior to the start of the session! (NOT prior to your presentation time).** E**ach presentation will last for 20 minutes, with 5 minutes of questions and answers, and 5 minutes to switch to the next team.** *If you are attending the presentations, please stay for the whole session and only leave the room during tea breaks.*

ALL teams must have one **poster presentation (4 ft width X 6 ft height)**, the poster locations are to be assigned and will be posted in details at the poster sessions. **The official poster presentation is from 5:30 pm to 6:30 pm on Oct 5, Saturday.** However, your poster judges will read posters all the time and put a sticker on the posters they have read. **Posters must be removed by Sunday 12:30 pm. Any remaining posters will not be saved.**

2.5 Foods:

Food will be provided throughout the Regional Jamboree. Your team bags contain meal tickets, which will be used to pick up your food. *Badges must be (visibly) worn in order to have access to all food and the High Table Dinner.* Teams have been assigned to food counters in order to spread out the crowd and cut down on the time you have to wait on line. We ask that you please pick up your food in your assigned counter, although you are free to eat it where you wish except inside the lecture theatres!

2.6 High Table Dinner and Mascot Green Show:

On Saturday night after the presentation sessions, we will be hosting the iGEM Asia 2013 Regional Jamboree High Table dinner in the Ho Sin Hang Hall at 6:45 pm and the Social Event will also be held at the same place from 8:30 pm to 10:00 pm. The social event will be a Mascot Green (Fashion) Show. *The rule of this competition is to use any recyclable materials to make an elegant or awesome dress, or extraordinary outfit, and put them on to show us on stage.* You have one minute to show off and appeal for other teams' support and votes. We have also prepared some local-brewed entertainment from Shaw Band for you. After a full day of presentations, the Regional Jamboree Social Event will be a surprising change, so we highly encourage all iGEM participants to attend, relax and have fun! **Note:** You must have your iGEM name badge in order to gain access to the social event.

2.7 Closing and Award Ceremonies:

The Closing and Award Ceremonies start at 9 am on Oct 6, Sunday. The top three finalists will be announced at the closing ceremony and they are required to make their presentations in front of all judges and all teams. *Be prepared to bring you presentation materials on Sunday as your team is probably one of the finalists.* After the presentations, iGEM from above will take place at LT1 and the main entrance of YIA Park. You will be called back to the Award Ceremony when the judges completed their tasks at around 12:30 pm and then they announce the medals, special prices, and advancing teams to the World Championship.

2.8 The Full Schedule:

http://webhost1.ust.hk/~igemasia/resources/files/iGEM2013%20Asia%20Jamboree%20Schedule.pdf

iGEM Asia Jamboree 2013 - Finalized Schedule

Oct 4th, 2013 (Fri)

Time Period	Session (Venue)
4:00PM-9:00PM	1st Registration (G/F, YIA)
5:30PM-9:30PM	Presentation Rehearsal (72 slots) (LT 1 -9, YIA) / 1st Poster Set-up (G/F, 2/F, YIA)
5:00, 6:00, 7:00PM	Pizza Dinner (G/F, YIA)

Oct 5th, 2013 (Sat)

	LT 1	LT 2	LT 3	LT 4	LT 5	LT 6
8:00 AM	2nd Registration (G/F, YIA) / Breakfast (G/F, YIA) / 2nd Poster Set-up (G/F and 2/F, YIA)					
9:00 AM	Opening Ceremony (LT 1, YIA)					
9:30 AM	XMU-China	HUST-China	SCUT	CAU China	Tokyo-NoKoGen	Peking
10:00 AM	HIT-Harbin	Hong Kong HKUST	SUSTC-Shenzhen-A	BIT	UT-Tokyo	SydneyUni Australia
10:30 AM	Fudan	NU Kazakhstan	Osaka	Tianjin	WHU-China	Korea U Seoul
11:00 AM	1st Tea Break (G/F, YIA) / 3rd Poster Set-up (G/F and 2/F, YIA)					
11:30 AM	TzuChiU Formosa	USTC CHINA	LZU-China	HokkaidoU Japan	ITB Indonesia	Tokyo Tech
12:00 PM	Hong Kong HKU	KIT-Kyoto	SYSU-China	NCTU Formosa	Macquarie Australia	Kyoto
12:30 PM	NYMU-Taipei	TMU-Tokyo	Tsinghua	SCU China	Sumbawagen	
1:00 PM	Lunch (G/F, YIA)					
2:00 PM	Chiba	IIT Delhi	UESTC	OUC-China	NTU Taiwan	
2:30 PM	ZJU-China	AHUT China	SYSU-Software	Tsinghua-E	Shenzhen BGIC ATCG	
3:00 PM	NJU NJUT China	Nanjing-China	USTC-Software	KAIT Japan	Tsinghua-A	
3:30 PM	2nd Tea Break (G/F, YIA)					
4:00 PM	SUSTC-Shenzhen-B	SJTU-BioX-Shanghai	NJU China	HZAU-China	Biwako Nagahama	
4:30 PM	XMU Software	BIT-China	IIT Madras	AITM-Nepal	SCAU-China	
5:00 PM	Shenzhen BGIC 0101	Hong Kong CUHK	NTU-Taida	UI-Indonesia	UESTC Life	
5:30 PM	Poster Session with Drinks (G/F and 2/F, YIA)					
6:30 PM	Poster Session Continues (Participants & Poster Judges) (G/F and 2/F, YIA) / Deliberation (Track Judges) (LT 7, YIA)					
6:45 PM	Travel to Ho Sin Hang Hall (Participants) / Deliberation (All Judges) (LT 7, YIA)					
7:00 PM	High Table Dinner (Participants) (Ho Sin Hang Hall) / Deliberation Continues with Dinner (All Judges) (LT 7, YIA)					
8:30 PM	Social Event-Mascot Green Show (Ho Sin Hang Hall)					
9:30 PM	End of Day 2					

Oct 6th, 2013 (Sun)

8:00 AM	Breakfast (G/F, YIA)
9:00 AM	Opening Remarks (LT 1, YIA)
9:30 AM	Finalist 1 UG (LT 1, YIA)
9:50 AM	Finalist 2 UG (LT 1, YIA)
10:20 AM	Finalist 3 UG (LT 1, YIA)
10:40 AM	Finalist 4 OG (LT 1, YIA)
11:00 AM	Finalist 5 OG (LT 1, YIA)
11:20 AM	Tea Break (G/F, YIA) / Deliberation of judges (15 min discussion for UG / OG + 10 min of voting (LT 7, YIA)
12 noon	Group Photos (Outdoor G/F podium & staircases, YIA)
12:30 PM	Travel back to LT 1, YIA
12:40 PM	Announcement of Results and Awards (LT 1, YIA)
13:15 PM	iGEM Asia Jamboree 2013 is over

Competition Tracks

Environment	**Food & Energy**		**Foundational Advance**	**Health & Medicine**
Information Processing	**Manufacturing**		**New Application**	**Software Tools**

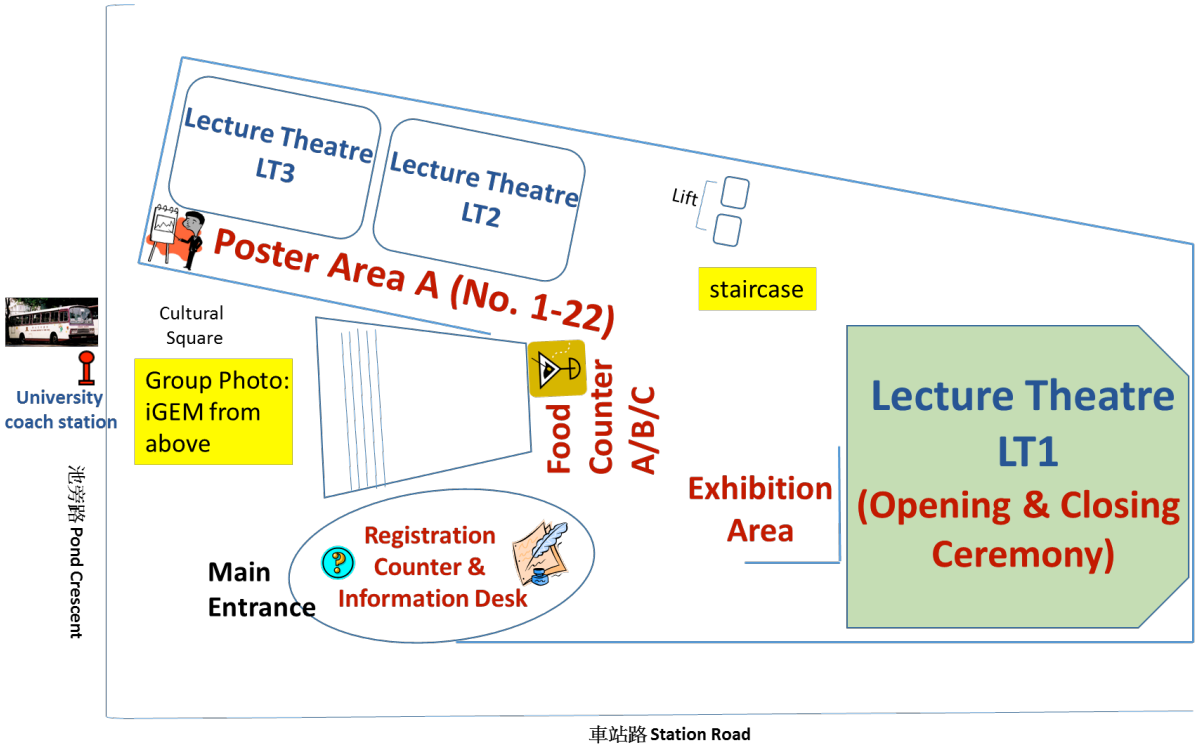
Abbreviation : YIA - Yasumoto International Academic Park WMY - Wu Ho Man Yuen Building

3. Site Maps, Floor Plan, Wi Fi, and Transportation

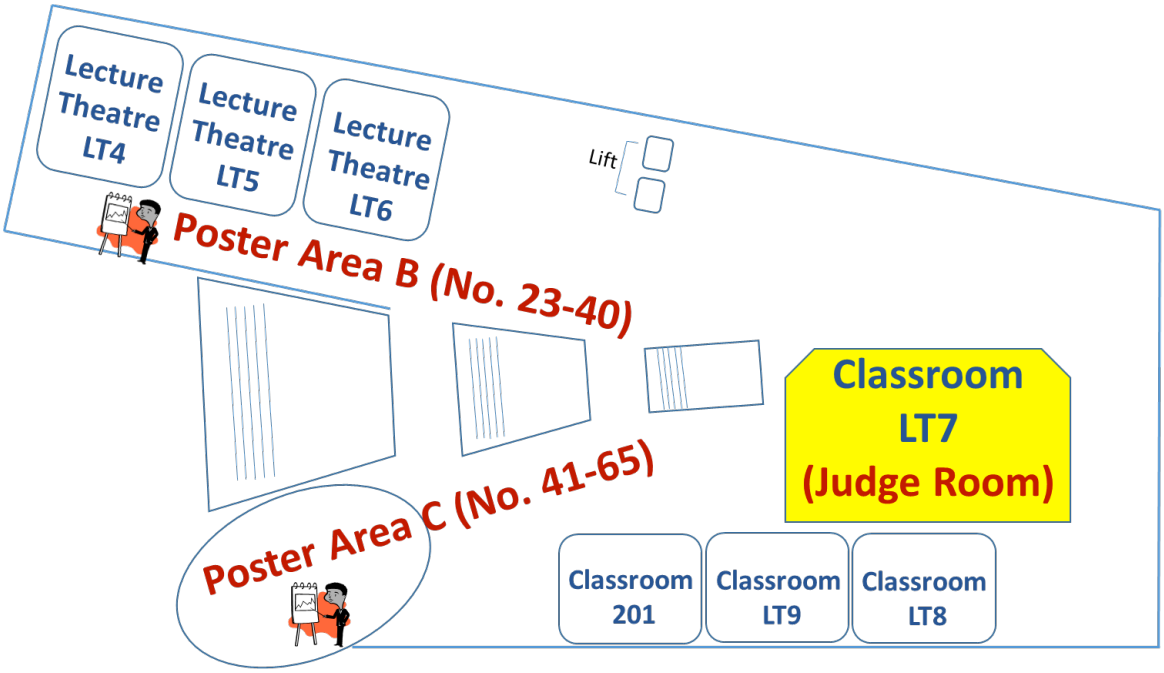
3.1. Site Map

3.2 Floor Plan in the Yasumoto International Academic Park (YIA)

Ground Floor



Second Floor



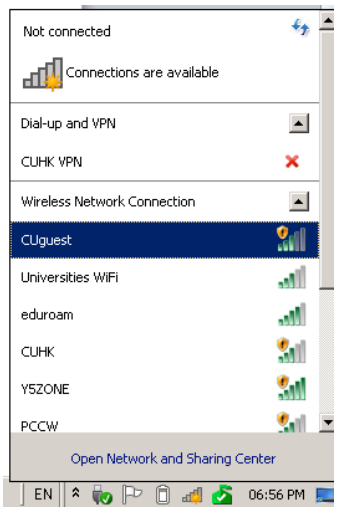
3.3 Instruction of wireless network connection

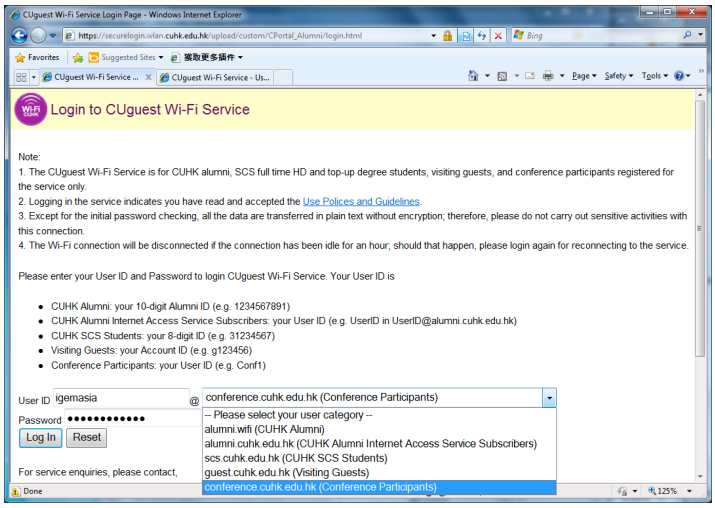
1. Select "**CUguest**"# for wireless network connection and connect
2. Open a web browser, and input "**igemasia**" for the user ID
3. Select " Conference.cuhk.edu.hk"
4. Input **Password** " **jamboree2013**"
5. Click " Log in"

#Remarks:

** For CUHK staff and students, please kindly select "CUHK" for wireless network.*

* Participants can also select "eduroam" as the wireless network if their institutions have joined this roaming service.





3.4 Transportation Schedule

A number of 60-seated shuttles will be provided to carry iGEMers between the CUHK and Regal Riverside Hotel. In order not to miss the shuttles, passengers are suggested to arrive earlier. *ALL services are for the participants residing at Regal Riverside Hotel ONLY*. The shuttle schedule is as follows:

October 4, 2013 (Fri)

From Regal Riverside Hotel to CUHK Yasumoto International Academic Park (YIA)

Depart from	Arrive at
Regal Riverside Hotel	CUHK (YIA)
3:45pm (Coach 1, 2 and 3)	4:00pm (Coach 1, 2 and 3)
4:00pm (Coach 4, 5 and 6)	4:15pm (Coach 4, 5 and 6)
4:15pm (Coach 7)	4:30pm (Coach 7)

From CUHK Yasumoto International Academic Park (YIA) to Regal Riverside Hotel

Depart from	Arrive at
CUHK (YIA)	Regal Riverside Hotel
10:00pm (Coach 1, 2 and 3)	10:15pm (Coach 1, 2 and 3)
10:15pm (Coach 4, 5, 6 and 7)	10:30pm (Coach 4, 5, 6 and 7)

October 5, 2013 (Sat)

From Regal Riverside Hotel to CUHK Yasumoto International Academic Park (YIA)

Depart from	Arrive at
Regal Riverside Hotel	CUHK (YIA)
7:45am (Coach 1, 2 and 3)	8:00am (Coach 1, 2 and 3)
8:00am (Coach 4, 5 and 6)	8:15am (Coach 4, 5 and 6)
8:15am (Coach 7)	8:30am (Coach 7)

From CUHK Ho Sin Hang Hall and CUHK Yasumoto International Academic Park (YIA) to Regal Riverside Hotel

Depart from	Arrive at	Arrive at
CUHK (Ho Sin Hang Hall)	CUHK (YIA)	Regal Riverside Hotel
10:15pm (Coach 1, 2 and 3)	10:20pm (Coach 1, 2 and 3)	10:35pm (Coach 1, 2 and 3)
10:30pm (Coach 4, 5, 6 and 7)	10:35pm (Coach 4, 5, 6 and 7)	10:50pm (Coach 4, 5, 6 and

October 6, 2013 (Sun)

From Regal Riverside Hotel to CUHK Yasumoto International Academic Park (YIA)

Depart from	Arrive at
Regal Riverside Hotel	CUHK (YIA)
7:45am (Coach 1, 2 and 3)	8:00am (Coach 1, 2 and 3)
8:00am (Coach 4, 5 and 6)	8:15am (Coach 4, 5 and 6)
8:15am (Coach 7)	8:30am (Coach 7)

From CUHK Yasumoto International Academic Park (YIA) to Regal Riverside Hotel

Depart from	Arrive at
CUHK (YIA)	Regal Riverside Hotel
1:20pm (Coach 1, 2 and 3)	1:45pm (Coach 1, 2 and 3)
1:45pm (Coach 4, 5, 6 and 7)	2:10pm (Coach 4, 5, 6 and 7)

4. Team Abstracts (http://igem.org/Team_List?year=2013)

AHUT_China
Shining Sanctifier
Track: Environment
Presentation: Lecture Theatre LT2 , Saturday, 2:30 PM
Poster: Poster area C, #55
Abstract: Water, the origin of life, is the necessary and elementary component of our daily life. Various kinds of means have been developed to dispose nitrite and ammonium, which are the main contaminants of this type of effluent. One of them is anaerobic ammonium oxidation bacteria (anammox) that can convert the fomite in the water into nitrogen. Our goal is to design a wastewater treatment system that can absorb the pollutant efficiently while transform it into luminous energy. We plan to use *E. coli* to design a bacterium that can digest the nitrite and ammonium in its interior using the disposal system from the anammox. Through the introduction of luciferase, the energy can be transformed into bioluminescence. Therefore, we named it Shining Sanctifier. This new star in synthetic biology will be applied to the sewage treatment system on a large scale while it can also be made into illuminating system.

AITM-Nepal

siRNA MEDIATED IMMUNE MODULATION FOR INNATE AND ADAPTIVE RESPONSE USING GENETICALLY ENGINEERED Escherichia coli

Track: Health & Medicine

Presentation: Lecture Theatre LT 4, Saturday, 4:30PM

Poster: Poster area C, #57

Abstract: Canonical small interfering RNA (siRNA) duplexes are potent activators of the mammalian innate immune system. The induction of innate immunity by siRNA is dependent on siRNA structure and sequence, method of delivery, and cell type. The delivery of siRNA in a packaged outer membrane vesicle of gram negative bacteria is the theme of our work. The toll like receptor-7/8 activation by siRNA in order to boost the production of Interferon type -1 molecules to inhibit the viral and outer membrane LPS structure to activate Toll like receptor -4 to inhibit bacterial pathogens is the objective of this work. The delivery is made dependent on the peptide fragment, which mediated the fusogenic mechanism so as to escape the endosomal compartment once endocytosed inside host (mamalian) cell. Thus freeing the siRNA to silence the myD88 transcript in host cytoplasm making RISC complex and hence, activating TLR-7/8 in endosomal membrane formerly.

BIT

A New Strategy to Detect Antibiotics in Milk: Based on Sensors with Controllable Bio-enhanced Blocks

Track: Food & Energy

Presentation: Lecture Theatre LT4 , Saturday, 10 :00 AM

Poster: Poster area C, #58

Abstract: Bio-amplification, especially controllable bio-amplification is significant for biological detection. In a synthetic biological way, 2013 BIT iGEM assembled the T7 RNA polymerase gene and T7 promoter as an amplification block (amplifier), which is based on the high activity of T7 promoter to amplify the signal. To make the magnification controllable, a lacO operator regulated by lacI was assembled in downstream as a control block (controller), by adjusting the concentration of IPTG. With this block, several sensors of materials including but not limited to antibiotics can be enhanced controllable. This year, a sensor of beta-lactam newly designed and one of tetracycline are applied to detect the residual of antibiotics in milk, which endangers human health. To make the detection faster and more convenient, milk samples and engineered *E. coli* are mixed in a tailor-made bio-chip and the green fluorescence will be detected and shown on tailor-made electronic equipment.

BIT-China

Intelligent Microbial Heat Regulating Engine

Track: New Application

Presentation: Lecture Theatre LT2 , Saturday, 4:30 PM

Poster: Poster area A, #10

Abstract: To keep the cells in a good condition, cooling system is used to control the temperature in fermentation process. However, the cooling system can result in a great consumption of energy, which increases the cost of production and causes resources wasting, global warming indirectly. To settle this problem, we constructed an Intelligent Microbial Heat Regulating Engine (I'MHeRE), which includes the customized thermo-tolerance system and the intelligent quorum regulating system, to help cells resist heat by regulating the expression of heat shock proteins and controlling the density of cells. The chassis host with I'MHeRE may make the fermentation less depends on the cooling system and shrink cost. Besides, cells could live well in higher temperature, because we extend their optimum living temperature and make them live in optimizing density. Owing to this, the activity of the enzymes in cells could be increased and the efficiency of microbial metabolism could be improved.

Biwako_Nagahama
AgRePaper&E.coli-ink
Track: Environment
Presentation: Lecture Theatre LT5 , Saturday, 4:00 PM
Poster: Poster area C, #45
Abstract: Cellulose is used as raw material for paper, so our team experimented various ways to increase the amount of cellulose produced by agrobacterium and using it to make papers. For this we developed the different parts to insert into the system of agrobacterium. Among them are the genes used for expression of the curdlan. Similarly, genetic parts in order to increase the expression of the cellulose, along with the agrobacterium type binary vector were also developed. We are also working on recycling the produced paper by degrading the cellulose to D-Glucose using various enzymes. We worked for the preparation of the biological ink using the sperm whale's cells by genetically modification to increase amount of myoglobin. Then, we observed the change on the color of the product by altering the formation of myoglobin and the production amount of myoglobin with the insertion of T7 promoter to the cell system.

CAU_China
Alcohol-Detoxic Beverage
Track: Food & Energy
Presentation: Lecture Theatre LT 4, Saturday, 9:30 AM
Poster: Poster area C, #44
Abstract: Alcoholism is prevalent in China. Here we decide to invent an alcohol-detoxic beverage that can considerably prevent alcoholism by adding one healthy bacterium-lactobacillus. In principle, this engineered bacterium can survive in the extremely acidic stomach environment and reduce the toxicity by converting alcohol to corresponding carboxylic acid through a two-step reaction. The two-step reaction is catalyzed by intracellular alcohol dehydrogenase (ADH) and acetaldehyde dehydrogenase (ALDH), respectively. We try to engineer both enzymes, ADH and ALDH, to be acid resistant for higher performance in human stomach.

Chiba
Magnetic E. coli
Track: New Application
Presentation: Lecture Theatre LT1 , Saturday, 2:00 PM
Poster: Poster area A, #2
Abstract: In nature, there exist a variety of magnetotactic bacteria. Recently, it was reported that non-magnetotactic cells such as yeast could be magnetized to some extent. We set the goal to transform E. coli into those that are attracted by magnets. By magnetizing E. coli, the cell harvesting process will be much simpler and more economical than the conventional processes such as centrifugation and filtration. To this end, we are conducting three itemized projects. (1) Modification of iron transportation network to import as much Fe ions as possible in E. coli, (2) sequestering/ storing iron into human ferritin, and (3) converting cytosolic space from reducing to oxidizing in order to elevate Fe(II)/ Fe(III) ratio within. Because all such manipulations significantly impact the physiology of the host cell, we are establishing the BioBrick platform that enables the temporal knockdown of multiple genes using recently control technology such as CRISPRi.

Fudan
ALeader: leading the advance of RNA synthetic biology
Track: Foundational Advance
Presentation: Lecture Theatre LT 1, Saturday, 10:30 AM
Poster: Poster area B, #30
Abstract: RNA regulation patterns, which have not been fully understood so far, is a research hotspot still

deserves exploiting. A recently-discovered riboswitch ALeader updated our ideas by its delicate, 75nt-structure consisting of an aptamer, a recombination site, and even a bicistron motif. Inspired by this natural design, we proposed a series of novel strategies this summer, with dynamic rather than static perspectives. Guided by the theoretical study on functional multistable states and semi-static states of a riboswitch, and the kinetics involving impacts from other systems such as CRISPR, RNA polymerases, ribosomes, and degradation complex, the ALeader-based functional multi-phase and tricistron switches are designed. We also tried to regulate aptamer's function by manipulating its working environment instead of itself, with SpinachALeader-based real-time monitors to avoid the signal distortion. Furthermore, to demonstrate the advantages of RNA biobricks, we constructed an antibiotic-detector with ALeader, optimized by a network with a RNA-OUT/IN translational regulatory system.

HIT-Harbin
B-POM: Biological proportional operational Mu-circuit
Track: Foundational Advance
Presentation: Lecture Theatre LT1 , Saturday, 10:00 AM
Poster: Poster area C, #62
Abstract: The composition of B-POM is that hrpR's promoter depends on the input, but hrpS'promoter is always Ptet and tet owns PhrpL, while the output gene follows tet and shares PhrpL. Once the input is sensed, the input promoter triggers hrpR's transcription. The activity of Ptet is constitutive, which means HrpS protein is ample. As HrpR accumulates, HrpS binds to HrpR and form HrpRS that then triggers PhrpL, and tetR and output begin to accumulate. tetR can inhibit Ptet. As a feedback, HrpS and HrpRS will decrease. PhrpL will be of lower activity, so the amount of tetR and the level of output will decline. The decrease of tetR will enhance the hrpS' expression. All these construct a feedback cycle. Finally, the output will stabilize and be in a certain proportion with the input. By manipulating the RBS of hrpR, hrpS, tetR and output gene, we can control input-output proportion.

HokkaidoU_Japan
"Maestro E. coli" ~optimization kit for expression~
Track: Foundational Advance
Presentation: Lecture Theatre LT 4, Saturday, 11:30 AM
Poster: Poster area A, #13
Abstract: Thousands of genes are expressed in living cells. The expressions of these genes are cleverly controlled by the promoters and RBSs. Precise regulation of recombinant genes is hard to achieve. Imbalance in regulation results in little production. However, it is hard to objectively select promoters and RBSs. We thought that E. coli could do the selection for us. We created a kit for E. coli to find the best-suited promoters and RBSs. It enables our lab E. coli to be like "Maestro" who creates excellent harmonies with lots of instruments. For the kit we created an original promoter and RBS families with different strengths. We checked and made these parts to be reliable. And it only takes a single golden-gate assembly to get your construct! We made the promoters and RBSs by selecting from randomized libraries. Using the kit, E. coli can choose optimal promoters and RBSs by her/it/him-self, just like the maestro.

Hong_Kong_CUHK
Switch off PAHs
Track: New Application
Presentation: Lecture Theatre LT2 , Saturday, 5:00 PM
Poster: Poster area B, #35
Abstract: To rapidly regulate biological process, we designed a novel transmembrane protein called Voltage Switch (VS), which is a fusion protein utilizing the voltage sensing domain from potassium ion channels.

Triggered by change in potential across the cell membrane, VS can separate or bring targeting enzymes into proximity, thus allowing an instant control of enzymatic reaction. We also utilized VS to accelerate the polycyclic aromatic hydrocarbons (PAHs) degradation system – another highlight of our project. The metabolites of certain PAHs are mutagenic and carcinogenic. We codon-optimized laccase from *Bacillus* sp. HR03 and catechol 1,2-dioxygenase from Pseudomonas putida KT2440 for *Escherichia coli*, which when forming a cascade, PAH degradation into less toxic simple carboxylic acid would occur. Since quinones are intermediates in the degradation of PAHs, we also added quinone sensing and response repressor (QsrR) to control the degradation process.

Hong_Kong_HKU
E. capsi: Reducing phosphate pollution using engineered E. coli that harvests polyphosphate
Track: Environment
Presentation: Lecture Theatre LT1 , Saturday, 12:00 PM
Poster: Poster area A, #20
Abstract: Phosphate pollution in waterways and water treatment plants is a major problem. Removal of phosphate from wastewater is required to treat phosphate-containing discharge to reduce eutrophication, algal blooms and "dead zones" in lakes, rivers and coastal marine ecosystems. The aim of this project was to remove or reduce the levels of inorganic phosphate from a system or environment by employing engineered bacteria *E. capsi*, capable of accumulating phosphate in the form of polyphosphate. Our strategy is to express polyphosphate kinase together with the ethanolamine utilization (eut) bacterial microcompartment from *Salmonella enterica* to provide an environment for polyphosphate synthesis. Furthermore, the project provides a novel way to recover accumulated polyphosphate, an energy rich macromolecule with many industrial uses. This paves a way towards living system-based phosphate pollution treatment to tackle critical environmental challenges.

Hong_Kong_HKUST
FATBUSTER - The Artificial Futile Cycle
Track: Health & Medicine
Presentation: Lecture Theatre LT 2, Saturday, 10:00 AM
Poster: Poster area C, #43
Abstract: While low-fat diet and regular exercise are popular approaches to fight with obesity, one easy alternative is simply to increase energy metabolism. In a synthetic biology approach, we are working to create an artificial futile cycle in mammalian cell by introducing glyoxylate enzymes native to bacteria. Past research has shown that mice expressing enzymes constituting an active glyoxylate shunt are shown to be resistant to diet-induced obesity. Our team plans to introduce an inducible system that allows us to couple the sensing of circulating fatty acid concentrations with an inducible circuit of glyoxylate shunt. Our inducible system is intended to prevent the risk of fatty acid deficiency, while facilitating greater fatty acid uptake at higher fatty acid circulating concentrations. Such a system should increase the feasibility of a glyoxylate cycle engineered to function in vivo.

HUST-China
Antihypertensive E. coli
Track: Health & Medicine
Presentation: Lecture Theatre LT 2, Saturday, 9:30AM
Poster: Poster area B, #25
Abstract: Hypertension causes grave concern worldwide for its notoriety, there're not many therapeutic methods to hypertension besides various antihypertensive drugs. However, this comes along with heavy financial burden to developing or underdeveloped countries. In addition, almost all these drugs have side effects

to liver and renal. Here is a novel method to treat Hypertension by constructing human-friendly engineering bacteria that can produce short-chain fatty acids (SCFA) periodically and naturally to help maintain the blood pressure in safe level. SCFA, especially acetate and propionate, has been proved to induce vasodilatation and ensuing hypotensive response via receptors in smooth muscle cells of vessels. This year we have found a metabolic pathway in Escherichia coli that converts succinate to propionate through Wood-Werkman reaction. An operon consisting four genes encodes enzymes in this pathway. By combining bio-oscillator and key gene together, we want to make E. Coli release propionate periodically in patients' intestine periodically.

HZAU-China
Safe moving vaccine factory
Track: Health & Medicine
Presentation: Lecture Theatre LT4 , Saturday, 4:00 PM
Poster: Poster area C, #42
Abstract: For HZAU-2013iGEM project, we are creating a safe moving vaccine factory by synthetic biology, which can spread Rabies vaccine in dogs rapidly and actively. Our aim is to help in the achievement of the WHO goal of being free of human rabies by 2020 through the improvement of the vaccination coverage in dogs. The idea comes from Yersinia pestis and fleas. We make use of fleas as our moving injector. When fleas feed blood from dogs, our vaccine vector *Bacillus subtilis* will be regurgitated into blood and successfully transferred to mammalian host. *Bacillus subtilis* can express antigens, which can stimulate the immunity of dogs. Meanwhile, endogenous or exogenous expression of "Antimicrobial Peptides" by *B. subtilis* can kill Yersinia pestis in fleas. In this way we achieved a safe moving vaccine factory.

IIT_Delhi
pHColi
Track: Environment
Presentation: Lecture Theatre LT2 , Saturday, 2:00 PM
Poster: Poster area C, #56
Abstract: pH induced response elicited by certain promoters in bacteria may have major practical applications. The response can be targeted for specific pH ranges, for example in tracking the anomalies associated with the gut micro-biota or detecting pH inside a bioreactor. There are only limited studies reported in the area. In the present project, a genetic circuit has been created, using the promoters of the acid shock response gene from E.coli and the F0F1 ATPase operon from C. glutamicum that produces a pH dependent colour gradient, much like a universal pH indicator. A mathematical model has been developed to simulate the experimental findings. The present study will form the basis for further research in the field of synthetic biology.

IIT_Madras
Combating Shiga Toxin: A Synthetic Biology Approach
Track: Health & Medicine
Presentation: Lecture Theatre LT3 , Saturday, 4:30 PM
Poster: Poster area B, #40
Abstract: Shiga toxin, a worldwide menace, has killed over 1 million people to date and continues to afflict almost 150 million people each year. Currently, there is no treatment for Shiga toxicosis and it leads to complications in the human system like hemolytic uremic syndrome (HUS) and renal failure. Here, we propose a two-fold, novel synthetic biology approach to combat the lethal effect of the toxin. We aim to neutralize the already produced toxin through a nine amino acid Gb3 mimic peptide. We have engineered the Gb3 mimic along with a cellular export signal (ompF) downstream of AHL (quorum sensing molecule) inducible promoter (pLuxR). We also plan to prevent further toxin production by inhibiting the biofilm formation of shigatoxigenic *E. coli* using indole-3-acetaldehyde (I3A). We expect to validate our approach through functional assays and in

silico modelling. Our findings can potentially initiate a new perspective of tackling Shiga toxicosis using synthetic biology tools.

ITB_Indonesia
Aflatoxin Biosensor
Track: Food & Energy
Presentation: Lecture Theatre LT5, Saturday, 11:30 AM
Poster: Poster area A, #4
Abstract: Aflatoxins are naturally occurring mycotoxins that are mutagenic and carcinogenic. Aflatoxin contamination of foods that are found in many developing countries may cause a serious problem for human health. ITB_Indonesia team for iGEM 2013 focuses on designing a whole cell biosensor for aflatoxin B1 detection in foods. The biosensor uses *Escherichia coli* as the chassis to build a genetic circuit using SOS response system to detect DNA damage caused by aflatoxin B1-oxide attack. The SOS response promoter is followed by a reporter gene coding a chromoprotein, therefore the concentration of aflatoxin B1 in food samples could be easily detected by the color change of the bacteria. For the ease of usage, we will design a syringe shaped device with our whole cell biosensor in it. This device would allow aflatoxin B1 to enter the device, but would not permit the cells to leave the device.

KAIT_Japan
Hay fever curE. coli
Track: Health & Medicine
Presentation: Lecture Theatre LT4 , Saturday, 3:00PM
Poster: Poster area B, #37
Abstract: Japanese on of six people is troubled now by hay fever. These people take a medicine for the hay fever. But, If they take it, they become sleepy. If become sleepy, they cannot work and study. So, we are working on a project to relive hay fever by Escherichia coli to improve these. Mechanism of hay fever when an allergen invades it in the living body, naïve T cell differentiates in Th2. There is more Th2 than Th1, and the mast cell and others that are humoral immunity become active, and inflammation is in this way caused. We perform following four this time. (1) Expression of IL-10 receptor to *E. coli*. (2) Phosphorylation of STAT3. (3) Preparation of gene array with HlyA and L-12 promoter and receiving the STAT3. (4) Preparation of gene array with TolC and HlyB and HlyD promoter and to receive the STAT3.

KIT-Kyoto
Fregrance coli
Track: New Application
Presentation: Lecture Theatre LT 2, Saturday, 12:00 PM
Poster: Poster area B, #39
Abstract: We are trying to construct a novel E.coli that has fruity flavor like Japanese rice wine (Japanese sake). In order to accomplish the purpose, yeast genes related with production of the Japanese sake fragrance were introduced into E. coli cells. We also tried to develop a way to eliminate bad smells of E. coli in parallel. Although we previously won a gold prize by the development of a novel pen (E. coli Pen) in 2010, its bad smells were weak points and must be improved. We will overcome this problem through the progress of our new project in 2013. So far, “smell” is not a popular keyword and not a major field in iGEM. However, we believe that our project will provide a new point of view to iGEM friends

Korea_U_Seoul
Pearl-coli: E. coli converting CO2 into a pearl powder (nacre)
Track: Environment
Presentation: Lecture Theatre LT6 , Saturday, 10:30 PM
Poster: Poster area A, #1
Abstract: The Korea_U_Seoul team aims to design Pearl-coli that is E. coli able to convert atmospheric CO_2 into pearl powder materials. The design is based on cell surface display of nacrein in *E. coli*. Nacrein is a major protein component in nacre (an organic-inorganic composite layer found in outer coating of pearls). We divided nacrein into functional regions - carbonic anhydrase (CA), calcium binding and scaffold repeats. CA domain fixes CO2 into carbonic acid changing to bicarbonate ion in aqueous solution. We will examine if displayed nacrein in E. coli can make a pearl powder in a solution or fabricate a nacre-like structure while atmospheric CO2 is fixed into bicarbonate. Once a nacre material can be prepared from Pearl-coli, we will grow E. coli in a confined container to make synthetic pearl. The Pearl-coli has dual-function such as (1) mitigate the global warming by CO2 reduction, (2) prepare valuable pearl-like raw materials.

Kyoto
Cycoli
Track: Information Processing
Presentation: Lecture Theatre LT 6, Saturday, 12:00 PM
Poster: Poster area B, #27
Abstract: Every organism has its own cycle such as the periodicity of cell division, ordered patterns of its body. Some kinds of the cycles are regulated just by two factors. Using E. coli, we applied this kind of periodicity formation. Firstly, we focused on oscillation regulated by RNA. We suspected if RNA world hypothesis is correct, there could be protein-depended oscillatory system. To show the possibility of cycle formation by RNA, we constructed an oscillator by utilizing two different types of functional RNA, which are transcriptional activator and repressor. Secondly, we also targeted on planar oscillation forming mechanism. A. Turing (1952) suggested a simple principle containing just two variables, which explains many organisms' epidermal pattern formation. However, it is not confirmed whether the pattern formation is only based on Turing's discourses. To check this, we used two types of E. coli, which secrete different factors, and regulated their population.

LZU-China
Twinkle Cancer Hunter
Track: Health & Medicine
Presentation: Lecture Theatre LT 3, Saturday, 11:30 AM
Poster: Poster area A, #11
Abstract: To construct a regulating vector of NF-κB signaling pathway by gene recombination technology, introducing into tumor cells with NF-κB to form a signal feedback control system. Using NF-κB binding elements as promoter, and IκB-GFP fusion protein as reporter. Then inverted into HEK-293T cells and DU-145 cells. Through the observation of the GFP to probe the expression of IκB, the expressed protein was identified by Western blot, etc. The constructing of a regulating vector of NF-κB signaling pathway provides a new method and thought for tumor gene therapy, and propels forward the research of NF-κB signaling pathway.

Macquarie_Australia
Green is the new black - Expression of Chlorophyll within Escherichia coli
Track: Food & Energy
Presentation: Lecture Theatre LT5 , Saturday, 12:00 PM
Poster: Poster area B, #33
Abstract: Photosynthesis is a key biological pathway that uses sunlight energy to convert water and carbon

dioxide into ATP, glucose and oxygen. Chlorophyll is a green pigment that facilitates this energy production in photosynthetic organisms. Although the biosynthesis pathway for chlorophyll has been thoroughly investigated, the reproduction of this pathway in a non-photosynthetic organism has, to date, not been achieved. Successful production of chlorophyll in a bacterial host is the first step towards the synthetic construction of photosystem II, and the eventual creation of a renewable energy source. Our research involves expression of twelve genes (from *Chlamydomonas reinhardtii*) necessary for the chlorophyll biosynthesis pathway in a bacterial host (*E. coli*). Gene sequences have been synthetically designed to allow for prokaryotic expression. By utilizing Gibson assembly, we plan on being able to successfully produce chlorophyll in prokaryotic cells. This will be evident from the growth of green *E. coli* colonies.

Nanjing-China
Atrazine Elf
Track: Environment
Presentation: Lecture Theatre LT2 , Saturday, 3:00 PM
Poster: Poster area A, #3
Abstract: Atrazine, a widely used herbicide, persists for a long period in the environment once used. It causes metabolic disorders in both animals and humankind. Our team utilized the ribosome switch induced by atrazine, a QS system of Plux and a degrading enzyme to control *E. coil*'s motility through regulating it's CheZ gene. Therefore, *E. coli* can recognize atrazine, recruit team workers, and degrade atrazine. Our team found a transporter of atrazine, which we call TRM. We also mutated the degrading enzyme, TrzN, making it better at degradation. We combined TRM and the TrzN to improve atrazine absorbance and degradation. Moreover, our team is trying to analyze and compare several systems with computer, hoping to find the best one which is equipped with faster moving and quicker degrading. Overall, we believe our system will boost the industrialization, universalization as well as standardization in the field of treatment for atrazine and other versatile small molecules.

NCTU_Formosa
E.colightuner
Track: Foundational Advance
Presentation: Lecture Theatre LT4 , Saturday, 12:00 PM
Poster: Poster area C, #60
Abstract: We have proven an sRNA-regulated system of our own to be an effective and competent way for regulating gene expressions. Recent studies have shown that sRNA-mediated regulation is an important factor to bacterial growth. sRNAs work by base pairing with limited or extended complementary target mRNAs, regulating protein productions. Using sRNA mechanism, we can control gene expression in RNA level, in contrast to common promoters that functions on DNA level. Since the existing sRNAs in *Escherishia coli* have important functions in other metabolic processes, we designed an artificial sRNA with high specificity to avoid undesired base binding in vitro. By using the sRNA-regulated system, red light induced operator, and thirty seven degree Celsius ribosome binding site (RBS), we constructed a manipulatable system that is capable of expressing four different genes under different conditions. In other words, it is a multitask machine.

NJU_China
Biomissile: a novel drug delivery system with microvesicle
Track: Health & Medicine
Presentation: Lecture Theatre LT 3, Saturday, 4:00 PM
Poster: Poster area A, #19
Abstract: Recently, small interfering RNA (siRNA) has emerged as a promising therapeutic drug against a wide array of diseases. However, site-specific delivery has always been a challenge in gene therapy.

Microvesicles (MVs) are lipid-bilayer vesicles, which are naturally secreted by almost all cell types, playing crucial roles in intercellular transport of bioactive molecules. Given the intrinsic ability to naturally transport functional RNAs between cells, MVs potentially represent a novel and exciting drug carrier. In our project we are trying to express both anti-virus siRNA within the cell and target protein on the surface of the MVs by engineering the HEK 293T cell, which is capable of producing large amounts of MVs. Thus, the MVs produced by our engineered HEK 293T cells will contain the siRNA and be able to specifically deliver the siRNA to the sites we want, acting as biomissile for the targeted destruction of the disease.

NJU_NJUT_China
The Application of Cas9 as a Gene "Missiles"
Track: New Application
Presentation: Lecture Theatre LT 1, Saturday, 3:00 PM
Poster: Poster area C, #50
Abstract: Most bacteria and archaea can resist invading DNA and/or RNA elements via the clusters of regularly interspaced short palindromic repeats (CRISPRs). It is believed that the integrated CRISPR sequences have the ability to form a genetic memory, which prevents the host from being infected. The memory exists as a DNA library in genome, artificially modified to set its target. The CRISPRs and Cas (CRISPR-associated) interact and form this prokaryotic adaptive immune system. Cas9, as a core of CRISPR system, can play a role of targeted-attacking gene "missiles". Therefore, we build a sort of plasmids, loading CRISPR system, to realize the "killing" of harmful genes and/or organisms.

NTU-Taida
QS array
Track: Health & Medicine
Presentation: Lecture Theatre LT3 , Saturday, 5:00 PM
Poster: Poster area A, #21
Abstract: Bacterial infection is the invasion of the body by pathogenic bacteria, which causes pneumonia, urethral infection, bacteremia and other symptoms in hospital and community. The efficiency of traditional detection and diagnostic approaches is impeded by the time-consuming laboratory procedures, yet many of which grow poorly in bacterial cultures. All these limitations call for a new rapid and direct bacterial identification method to improve patient management and antimicrobial therapy. Quorum sensing is a type of bacterial cell-cell communication correlates with the population size. Many bacteria have one or several species-specific quorum sensing molecules released in different growth state and environment. Quorum sensing signals are shown to be involved in many physiological functions, including virulence, biofilm formation and drug-resistance. We aim to establish a novel bacterial identification method in clinical samples based on the quorum sensing profiles.

NTU_Taiwan
YeasTherm - against the cold
Track: Food & Energy
Presentation: Lecture Theatre LT5 , Saturday, 2:00 PM
Poster: Poster area A, #17
Abstract: During winter season, due to low temperatures, fish farming is one of the most heavily affected economic venues. Due to this, year after year, several farmers are faced with many problems as a result of a loss of fish product. Using our background in bioengineering we suggest an innovative alternative: Our idea is based on heterologues expression of SrUCP in *Saccharomyces cerevisiae* and *Rhodotorula glutinis*. Through the expression plasmid, yeasts are transformed from the wild-type phenotype into a thermogenic phenotype.
To implement this idea and make it simple and efficient, we plan to drive the expression of SrUCP under the

control of cold shock promoter Tir1. In this way, yeasts will generate heat only when the temperatures drop. Moreover, applying genetic circuits, providing the means to manipulate the biological device to suit different temperature conditions and needs in application, may regulate the temperature-responsive range of Tir1.

NU_Kazakhstan
Detection of Carcinoembryonic antigen with sandwich-biosensor
Track: Health & Medicine
Presentation: Lecture Theatre LT2 , Saturday, 10:30 AM
Poster: Poster area A, #22
Abstract: Carcinoembryonic antigen (CEA) is the cancer biomarker at early stages of several cancers including colorectal carcinoma, lung carcinoma and others. The aim of the study is to develop a biosensor that can be used in the detection of CEA. In the first part of the study ssDNA aptamers, with strong affinity for CEA, were selected by 12 cycles of Systematic Evolution of Ligands by Exponential Enrichment procedure, and characterized with dot-blot analysis and Surface Plasmon Resonance methods. In the last part, it is planned to clone the genes that will assist in expression of streptavidin on the surface of *E. coli* and *S. cerevisiae* membrane. *E. coli* will deliver streptavidin on the surface via Lpp-Omp expression system, while *S. cerevisiae* via Aga1 – Aga2 system. Modified model organisms, aptamers and CEA will be used to construct sandwich-biosensor.

NYMU-Taipei
Bee. coli: to bee, or not to bee
Track: Environment
Presentation: Lecture Theatre LT 1, Saturday, 12:30 PM
Poster: Poster area C, #61
Abstract: To save bees from Nosema ceranae, the culprit of colony collapse disorder, we created Bee. coli. from *E. coli* K-12 MG1655, a bacterium residing natively in bees. Bee. coli is strategically designed to work as follows. First, it continuously secretes mannosidase to inhibit the sprouting of *N. ceranae* spores. Second, if the bee is infected, the fungus-killing-circuit with a positive feedback design will be turned on to wipe out *N. ceranae*. Third, if these designer weapons should fail to conquer *N. ceranae*, our designed bee-suicide-operon will be activated to kill the infected bee and save its companions. Fourth, a light-inducible lysis system is included to ensure our Bee. coli only lives inside of the bee. Fifth, we apply encapsulation as the way to send Bee. coli into the bee. Since the capsule will only dissolve in a bee's gut, our Bee. coli will not spread to the environment.

Osaka
Beat the discrimination against E.coli !
Track: Information Processing
Presentation: Lecture Theatre LT 3, Saturday, 10:30 PM
Poster: Poster area C, #59
Abstract: Since the middle of the 20th century, *Escherichia coli* (*E. coli*) have made great contributions to various field of our society. Although they have played essential roles in the society, it seems that the general public does not properly appreciate them. People's common images to *E. coli* are very negative (dirty, stinky, dangerous etc). So in our project, to wipe away the negative images to *E. coli*, we have created a circle that enable them to communicate with each other via nutrient production. And we made "empathetic *E. coli*" that lives cooperatively with each other. Then, by conducting experiments and using computer simulation, we have examined how they live and grow in liquid medium culture and what kind of pattern they form on solid medium culture.

OUC-China
Reconstructing the Magnetosome Membrane in E. coli
Track: Foundational Advance
Presentation: Lecture Theatre LT 4, Saturday, 2:00 PM
Poster: Poster area A, #15
Abstract: Membranous organelles are unique structures of eukaryotic cells, rare bacteria and paleontology. *Magnetospirillum magneticum* is an important biological model system of prokaryotic organelle study because the structure of magnetosome in *Magnetospirillum magneticum* has similar traits to eukaryotic organelles with membranes. Our task is to reconstruct the magnetosome membrane in *Escherichia coli. Magnetospirillum magneticum* requires a micro-aerobic and oligotrophic environment in order to produce magnetosome, so the significance of our project lies in simplifying the magnetosome produce method, opening up the path for futher functional gene research. We use homologous recombination to transfer the mamAB gene into *E. coli* to build an IMS part. Also, as the mamK gene is crucial to the IMS construction, we want to improve the mamK gene's expression by stabilizing its mRNA with a new method, hoping it can be used to promote the IMS construction. So we design a DNA segment to slow down mRNA degradation.

Peking
Aromatics Busted
Track: Environment
Presentation: Lecture Theatre LT 6, Saturday, 9:30 PM
Poster: Poster area C, #52
Abstract: Aromatic pollution is becoming a worldwide concern, and monitoring aromatics remains challenging. Noting the abundant genomic data of prokaryotes from aromatics-rich environment, Peking iGEM applied part mining to the genetic repertoire to develop a comprehensive set of biosensors for aromatics. The transcriptional regulators for each typical class of aromatic compounds were bioinformatically determined and promoter engineering and protein engineering were performed to tune their function. To expand the detection range, enzymes in upper pathways, working as plug-ins, were coupled with biosensors to degrade aromatics to detectable compounds. For environmental detection, we construct the band pass filter to detect a certain range of concentration. Responses of biosensors equipped with band-pass filter can robustly reflect the concentration of environmental samples. Peking iGEM has remarkably enriched the library of biosensors for aromatics and enabled quantitative detection for environmental monitoring. These biosensors will be also potent for metabolic engineering and well-characterized synthetic biological tools.

SCAU-China
Detection and degradation of organophosphorus compounds
Track: Environment
Presentation: Lecture Theatre LT 5, Saturday, 4:30 PM
Poster: Poster area C, #47
Abstract: Synthetic organophosphorus (OP) compounds, which are highly toxic contaminants in agro-environment and food security, have been widely applied to pesticides. Parathion is a typical representative of organophosphorus pesticides. This year, our goal is to construct a p-Nitrophenol sensor in *E. coli*, which is the degradation product of parathion, in order to reflect the existence of parathion. Besides, we try constructing a degradation system to solve the pollution problem. Considering the biosafety problem, we also design a suicide system in which the lethal genes are only triggered by declining p-Nitrophenol concentration. This will enable the bacteria to commit suicide when p-Nitrophnol is sufficiently degraded.

SCUT
E. cerevisiae
Track: Information Processing
Presentation: Lecture Theatre LT3 , Saturday, 9:30 AM
Poster: Poster area A, #18
Abstract: *E. cerevisiae* is a sophisticated signal transport system between *E. coli* and *S. cerevisiae*. Producer, the *E. coli*, is assigned to distribute a special volatile—butanedione periodically with a stable oscillation circuit, which defines the meaning of the signal. On the other side, Sniffer，the yeast, transplanted with a nose from nematode, can respond to the signal immediately. We hope this can realize the communication between prokaryotes and eukaryotes for the further research on symbiosis.

SCU_China
Imitations of Gametogenesis & Sexual Reproduction using E. coli
Track: Foundational Advance
Presentation: Lecture Theatre LT4 , Saturday, 12:30 PM
Poster: Poster area B, #32
Abstract: We intend to construct two groups of differentiated *E. coli*, one imitates the male multicellular organism, the other for the female. When cultured separately, the male/female multicellular system gets bigger and matures, and cells will differentiate into gametes, which cannot divide any more but are capable of gene transfer. After that, you mix these two liquid cultures; the male gametes will recognize the female cells and begin to transfer modified F plasmids into female gametes through sex pili. The conjugation makes female gametes return to the state of un-differentiation (called G cells), which means they can divide again but are not sexually determined. Then, after several cell divisions, one G cell will differentiate into a G+ or G-, which, like zygote, can grow into next generation of the multicellular system maybe containing genes from both male and female gametes

Shenzhen_BGIC_0101
Genovo
Track: Software Tools
Presentation: Lecture Theatre LT 1, Saturday, 5:00 PM
Poster: Poster area B, #34
Abstract: Genovo is a Computer-Aided Design (CAD) tool used for denovo design of genome. The current version consists of 4 parts. The first, Chromosome Construction will grap genes in a common pathway and chromosome features to build a new genome and let user to define the order and orientation in drap-drop way. The second, Nucleotide Modification will optimize and soften the sequence of CDSs. It also helps design the CRIPSR sites so that we can silence the wild type genes. The third, Chromosome Segmentation will cut chromosome into pieces and add 3A & Gibson & Goldengate & Homologous Recombination adaptors to the pieces automatically for assembly. The last one, OLS Design will guide users to gain the chromosome by microarray. Genovo will enable user to design their innovative chromosome as their wishes and further the research on genome on pathway level.

Shenzhen_BGIC_ATCG
Cell Magic
Track: Information Processing
Presentation: Lecture Theatre LT5 , Saturday, 2:30 PM
Poster: Poster area A, #7
Abstract: Cell Magic plays a gorgeous movie show in the both *E. coli* and *S. cerevisiae*. Various colors are blooming in different branches & buds: plasma membrane, nucleus matrix, mitochondria membrane & matrix,

vacuolar membrane, peroxisomal membrane, centrosome, and also actin. But the scene is far from static, colors will show up in order under the sophisticated cell cycle system at G1, S, G2 or M phase. Accelerator—degradation system is applied to run this movie faster, and freezer—sic1 system will put off the cell cycle during G1 phase. Beside, the editor—intron will expands a random dimension, leading to produce more combining forms.

SJTU-BioX-Shanghai
Metabolic Gear Box
Track: New Application
Presentation: Lecture Theatre LT2 , Saturday, 4:00 PM
Poster: Poster area A, #14
Abstract: Few researches have been done to regulate gene expression levels in genomic scale so far. This year we aim to combine two systems together in order to provide a universal and convenient tool, which can be used to regulate different genomic genes simultaneously and independently in a quantitative way. Our project involves the newly developed gene regulating tool CRISPRi and three light-controlled expression systems induced by red, green, and blue light respectively. Simply by changing the regulating parts in CRISPRi system towards mRFP, luciferase, and three enzymes, we hope to prove our system can be used qualitatively, quantitatively and practically step by step. We have also designed a box and written software as our experiment measurements. Simply by typing in several parameters, different gene expression levels can be controlled. This system can also be improved to predict the maximized producing efficiency after some simple tests in future.

Sumbawagen
E. coli which able to measure the level of sugar in honey by emitting light
Track: Food & Energy
Presentation: Lecture Theatre LT5 , Saturday, 12:30 PM
Poster: Poster area C, #41
Abstract: Glucose and fructose are major sugar component of honey. Sumbawa honey is protected as geographical indication by Indonesian patent office. Sode Lab at Tokyo University of Agriculture and Technology has created a fusion of mutant glucose binding protein and firefly luciferase, which able to measure glucose level by emitting light - intended initially for blood glucose sensor application (Taneoka et al, 2009). In this project, we plan to create this construct in Biobrick format, and evaluate the ability of transgenic E. coli for the measurement of glucose in honey. Our final goal is to create a device, which can be used for quality control of Sumbawa honey, which we call "ECONEY".

SUSTC-Shenzhen-A
Game Theory--Strategy for the Classic Prisoners' Dilemma
Track: Information Processing
Presentation: Lecture Theatre LT3 , Saturday, 10:00 PM
Poster: Poster area A, #16
Abstract: There are many applications of the game theory in some aspects of our life. Each individual has two kinds of choices--to betray or stay silent, and the choice you make would determine your fate. To betray the other side, you may risk being revenged. While staying silent, companion's betrayal may hurt you deeply. As for our project, we work out a new way to imitate the game theory by constructing a community of two E. Coli bacteria. Here we use the growth rate of each species to represent its fate. The effect of one's silent or betrayal on the other species' fate is acted through intercellular signal molecules of two quorum sensing systems. Each signal molecule regulates the expression of toxic genes in the other species and reduces its growth rate. We characterize the consequence of each strategy by quantitatively measure the growth rates of each species in the community.

SUSTC-Shenzhen-B

3Miao BioCommunity——A Synthetic Biology Community with the theme of Mind Map

Track: Software Tools

Presentation: Lecture Theatre LT1 , Saturday, 4:00 PM

Poster: Poster area B, #31

Abstract: 3Miao BioCommunity is a Synthetic Biology Community for people to find perfect and share their ideas. And the theme of our community is Mind Map, a excellent way to expand people's mind and organize ideas. Mind Map also is a structure to connect all the ideas of users in our community. If users have any problem about their ideas and need someone to have a discussion, they can use live chats system and contact someone with a similar idea. When having a clear idea, people can use logical genetic designer to edit gene circuits and check the theoretical genetic relationship. It is a good way to modify their ideas and confirm the protocol of the project. So 3Miao BioCommunity is helpful for people to come up ideas and realize them.

SydneyUni_Australia

Keeping DCA at Bay - Assembly of synthetic constructs and cassettes for degradation of dichloroethane

Track: Environment

Presentation: Lecture Theatre LT6 , Saturday, 10:00 AM

Poster: Poster area C, #46

Abstract: The picturesque city of Sydney is marred by industrial efflux of chlorinated hydrocarbons into the aquifers around Botany Bay. 1,2-dichloroethane (DCA) is toxic and a suspected carcinogenic agent, and one of the more soluble and mobile contaminants. Conventional DCA treatment is both costly and time-consuming, involving pumping and heat-stripping groundwater. We propose a biological alternative, which may be cheaper and more effective. There are strains of bacteria able to degrade low levels of organochlorine compounds in selective conditions. Polaromonas JS666 and *Xanthobacter autotrophicus* GJ10 contain two pathways of particular interest. Our goal is to construct our own versions of two metabolic pathways of DCA biodegradation for comparison in a BioBrick-compatible vector, and characterize their effectiveness in utilizing DCA as a sole carbon source for growth. We hope to create friendly strains of bacteria capable of removing DCA at greatly reduced cost and effort, and reduce the environmental impact of industry.

SYSU-China

iPSC Safeguarding Device

Track: Health & Medicine

Presentation: Lecture Theatre LT 3, Saturday, 12:00 PM

Poster: Poster area A, #9

Abstract: Since Shinya Yamanaka published the epoch-making paper in 2006, the induced pluripotent stem cells (iPSCs) have become one of the most promising techniques in regenerative medicine. Like embryonic stem cells (ESC), iPS Cells can be differentiated into any tissues. Compared with ESC, iPSC is easier to attain, immune rejection-free, and ethical issue-free. However, Further application of human induced pluripotent stem cells (hiPSCs) in translational medicine requires the concerns of two problems: the specificity of directional differentiation and the safety of the transplant. Here we design a new device which can spontaneously select hepatocytes from iPS-differentiated cell mass and prevent potential carcinogenesis. To achieve accurate spatiotemporal control, we build a miRNA-122 sensor and make use of the tetracycline induction system. Our work may also be extended to the field of gene therapy, and provide a new direction to our train of thought about how to solve the safety problem in genetic manipulation of human cells.

SYSU-Software
CAST (Computer Aided Synbio Tool)- An Integrated Tool for Synthetic Biology
Track: Software Tools
Presentation: Lecture Theatre LT3 , Saturday, 2:30 PM
Poster: Poster area C, #51
Abstract: Accurate simulation and gene circuit design are essential but difficult parts in synthetic biology. Here, we designed CAST to cover the workflow from beginning to end, users can focus on function design and the gene circuit would be automatically designed. Furthermore, we developed a new simulation model that work with standard dynamic characteristic and verified by wetlab experiments. Moreover, we build an expandable database that users can contribute their own dynamic information, which would lead to more accurate and sufficient dynamic information of all the Biobricks. Finally, our software is designed as an easy deployed server so that it can be used on personal purpose or shared by a whole lab or institution.

Tianjin
Alk-Sensor, a Novel Detector Applied for the Selection of Alkane Producers
Track: Food & Energy
Presentation: Lecture Theatre LT4 , Saturday, 10:30 AM
Poster: Poster area B, #26
Abstract: Biosynthesized alkanes are promising candidates for drop-in replacement of petroleum. We constructed and characterized a device named Alk-Sensor, which can sensitively detect a wide range of alkanes and generate certain response. Alk-Sensor is composed of ALKR protein——a transcriptional regulatory protein, and promoter alkM. ALKR recognizes alkanes and their interaction triggered a conformation change of ALKR dimers, which isomerizes the promoter-RNAP complex and led to activate the downstream genes of PalkM. Based on Alk-Sensor, we built a relationship between productivity of alkanes with strain's growth rate under certain environmental stress. Starting from this relationship we further designed a novel selection method to select out the engineered strains with highest productivity of alkanes. We demonstrated that this novel selection method could enable us to select out the optimized strains effectively and efficiently.

TMU-Tokyo
Genomic "Pythagorean Devices"
Track: New Application
Presentation: Lecture Theatre LT2 , Saturday, 12:30 PM
Poster: Poster area B, #29
Abstract: In this year, TMU-Tokyo created Genomic "Pythagorean Devices". Pythagorean Device appears Japanese famous educational TV program "Pythagorean Switch" Pythagorean Devices are known in the US as "Rube Goldberg machines". Pythagorean Devices are deliberately over-engineered or overdone machines that perform a very simple task in a very complex fashion, usually including a chain reaction. We constructed a Pythagorean device in Escherichia coli genome, using lambda phage recombination system "RED".

Tokyo-NoKoGen
Twinkle.coli -Fast cycle! Fast response!-
Track: New Application
Presentation: Lecture Theatre LT 5, Saturday, 9:30 AM
Poster: Poster area C, #63
Abstract: We created Twinkle.coli, which "blinks" fast like a firefly. An oscillator is a system that responds in periodic changes. This response is usually regulated by positive or negative feedbacks by using inducer or repressor proteins. However, the use of proteins might delay the response because transcription and translation must happen before the next output. To design an artificial fast responding oscillating circuit, we designed an

RNA-based oscillator. We used RNA-responsive self-cleavage ribozymes whose cleavage is regulated by an RNA molecule. The ribozyme cleavage cuts-off an "RNA scaffold" that harbors RNA aptamers. This aptamer binds to its specific target proteins, which are directly fused to reporter protein. This binding recruits the already translated split reporter protein complementation resulting in the output (twinkles). Our system enabled fast response and short oscillation cycle.

Tokyo_Tech
'Mutant Ninja. coli'
Track: Information Processing
Presentation: Lecture Theatre LT 6, Saturday, 11:30 AM
Poster: Poster area C, #53
Abstract: In our project, we propose to create E. coli that mimic some of the qualities of Japan's ancient 'ninja' warrior-spies. A ninja must receive and pass on correct information at all times. A mistake will be fatal. We have created a circuit that avoids crosstalk between two signals in cell-to-cell communication, and we are also looking into applications for it. Ninjas are also known for their star-shaped 'shuriken' throwing knives. Our E. coli ninja has a similar weapon, an M13 phage that it releases to infect other E. coli, injecting plasmid DNA into them. Finally, ninja must harmonize with the natural environment, so their relationship to it is very important. Plant hormones help plants to grow efficiently, and we are attempting to construct a circuit that synthesizes two plant hormones depending on the soil environment.

Tsinghua
Mobile Health---Pathogen detector
Track: Health & Medicine
Presentation: Lecture Theatre LT 3, Saturday, 12:30 PM
Poster: Poster area A, #5
Abstract: In a long term, the testing of pathogenic diseases is via comparably complex procedures. This year, we aim to design a sensing yeast powder based portable test paper, that is, the " mobile" testing system, take advantage of querom sensing system in bacteria, to achieve the testing of specific microorganism caused disease. In the same time, we built a frame of testing any pathogen that will cause diseases, using different the input and output combination. Furthermore, in order to achieve the simultaneous testing of different pathogens, we design a "fast-shifting box" to accomplish the combination of input and output signaling. This will in theory

Tsinghua-A
Synthetic gene switch shows adaptation to DNA copy number variation
Track: Information Processing
Presentation: Lecture Theatre LT 5, Saturday, 3:00 PM
Poster: Poster area A, #6
Abstract: In some natural and synthetic biological networks, DNA copy number which transfection into cells is fluctuant，influencing gene expression. We hope target gene expression level has a strong adaptability and ability to DNA copy number by using the method of engineering and bringing in incoherent feed-forward circuit. The robust circuits we designed may apply to cancer detection and gene therapy in the future. Generally speaking, we modeled three and four nodes motifs to find some appropriate circuits, which function reliably in the face of fluctuating stoichiometry of their molecular components. Two designed circuits have been tested and we found that the motifs have certain robustness to DNA copy number.

Tsinghua-E
Darwinian evolution for microbial cell factory: in vivo evolution engineering towards tryptophan-overproduction superbug
Track: Manufacturing
Presentation: Lecture Theatre LT4 , Saturday, 2:30 PM
Poster: Poster area C, #49
Abstract: Darwinian evolution shows great power in creating incredible biological function in amazing speed. Inspired by this, our team aimed at creating novel fast and irrational microbial cell factory by simulating natural Darwinian evolution process. With tryptophan as target product, a novel tryptophan biosensor utilizing translating ribosome mechanism was firstly developed as the foundation for tryptophan productivity and selection pressure switch module. We further constructed this tryptophan overproduction selection gene circuit coupling with in vivo mutation machine (mutator gene of mutD). By fine-tuning the selection conditions, our selection circuit showed good tryptophan dependent growth property, which provides the foundation for further evolution. As a preliminary result of this project, we successfully evolved an ancestor with zero productivity to a high-tryptophan producer only after several rounds of evolution.

TzuChiU_Formosa
Hypnoseq
Track: Environment
Presentation: Lecture Theatre LT 1, Saturday, 11:30 PM
Poster: Poster area C, #48
Abstract: The new pattern of antibiotic resistance is a spreading global issue that may soon leave us defenseless against bacterial infections. Taking a closer look, the lack of comprehensive pharmaceutical management system in Taiwan has come to our concern as it results in easy access to antibiotics. Large amount of antibiotics are added in the forage of animal husbandry and aquaculture, hence, leading to the increase of antibiotic resistance in Taiwan. In order to ameliorate this growing threat, we attempt to carry out “Hypnoseq.” to make this world a better place. The aim in this project is to combine the sense and antisense mRNA of the antibiotic resistance gene to inhibit the expression of the antibiotic resistance gene. Knowing that they have the ability to conjugate and deliver our designed plasmid to other bacteria, we are able to predict that they can decrease the percentage of antibiotic resistance in the environment.

UESTC
Nebula
Track: Software Tools
Presentation: Lecture Theatre LT 3, Saturday, 2:00 PM
Poster: Poster area C, #54
Abstract: Nebula is a biological circuit design tool composed of Interactive Part & Automatic Part. We classified the parts released in 2013 and constructed a database for users to choose what they want. In the first part, you are free to link any parts that we have already classified together to meet your requirement. In the second part, once you determine the inducer and the product, our software will offer you the optimized circuit with the input and output that you designated. We use Analytic Hierarchy Process to score every part and edges (passage linking two parts) according to attributions including availability, usefulness, sample status, part status and sequencing. According to weight of edges, we regard the shortest passage between input and output as the optimum presented to users. You can also save the circuits made in Nebula in case you want to check or change it later.

UESTC_Life

Multistage Degradation of Environment Haloalkanes Contaminant by Co-expression Enzymes

Track: Environment

Presentation: Lecture Theatre LT5 , Saturday, 5:00 PM

Poster: Poster area B, #36

Abstract: 1,2,3-Trichloropropane (TCP) and an organic pesticideγ-Hexachlorocyclohexane (Lindane，γ-HCH) have been shown to be serious pollutants as they are toxic and quite persistent in the environment, and need to be removed to low levels from polluted sites. Microbial degradation of these compounds represents an important and efficient way to fulfill the target. In order to improve biodegradation efficiency, several powerful genetically engineered E. coli strains have been constructed by the co-expression of key enzymes involving in the biodegradation pathways of the two compounds. For this, foot and mouth disease virus 2A peptide and polycistronic co-expression strategies were adopted. The results showed that all enzymes could co-expressed as a soluble protein with P2A peptide acting as a linker and F2A could function the same as in eukaryote system. Moreover, the resulting engineered E. coli exhibited an excellent capability for the degradation of TCP and γ-HCH.

UI-Indonesia

Project Blue Ivy - scFv with Blue Indicator as a Biosensor for TB

Track: Health & Medicine

Presentation: Lecture Theatre LT4 , Saturday, 5:00 PM

Poster: Poster area B, #24

Abstract: Tuberculosis (TB) is a worldwide major health problem, which infects one third of the world's population. The absence of reliable diagnostic tool in suburban area, where TB cases are most likely found, is still a great obstacle in TB eradication effort. Seeing Indonesia as one of the high burden countries for TB, UI-Indonesia iGEM team are trying to create a reliable, portable, and easy to use diagnostic tool for detecting TB. We are constructing a biosensor consist of highly specific antibody bound to a fragment of β-Galactosidase as a reporter to detect the presence of protein Ag85, a novel TB biomarker. Our goal is to make a biosensor that will detect the presence of antigen 85 in blood serum of TB suspect. Positive result will be indicated with easy to detect blue color, and when it's negative, no response will be observed.

USTC-Software

Gene Network Analyze and Predict (gNAP)

Track: Software Tools

Presentation: Lecture Theatre LT3 , Saturday, 3:00 PM

Poster: Poster area A, #8

Abstract: Synthetic biology creates and uses standardized parts such as Biobricks to build engineered bacteria for various function. To realize those purposes, importing exogenous genes to target bacteria is universal and essential. In this approach, improve or reduce the expression of target genes through interaction is inevitable. Experiments in wet lab could find the effect and choose the best of imported exogenous genes but take a long period of time. gNap utilizes Internet databases to construct a genetic regulatory network (GRN) and analyze the effect of exogenous gene by Michaelis-Menten equation and sequence alignment algorithm. Meanwhile, to guide wet lab experimenters to find the best-imported gene in the whole GRN, we use PSO method to figure out the best regulation patterns of new imported genes meeting experimenters' goal. To realize those ideas, we build gNAP that provides researchers with gene network analysis and prediction.

USTC_CHINA
T-VACCINE
Track: New Application
Presentation: Lecture Theatre LT2 , Saturday, 11:30 PM
Poster: Poster area A, #12
Abstract: T-VACCINE is a vaccine initiating immune response by penetrating the skin with the aid of transdermal peptide. From now on, injections are simply history.Based on the theory of user-friendly, a special group of engineering bacteria which produce T-VACCINE is used to create a brand-new "band-aid" serving as a guardian of our health .We have found a kind of transdermal peptide TD-1,a magical molecule that enhances the permeability of the skin as well as draw filamentous bacteriophages into the skin. By combining the gene fragments of antigen, immune adjuvant LTB and Luman-recruiting factor TNLFα with that of the TD-1, our team got the permeable fusion protein. In order to obtain large amount of extracelluar protein, we chose bacillus subtilis WB800N as our expression chassis. Further more, the universality of our experimental method is verified by the adoption of various antigen of existing vaccine, such as HBsAg, PA and AG85B.

UT-Tokyo
Multicellular Analog Clock
Track: New Application
Presentation: Lecture Theatre LT5 , Saturday, 10:00 AM
Poster: Poster area C, #64
Abstract: We designed a "multicellular" *E. coli* clock with a clock hand. Your naked eyes see the red clock hand moving along a circle of E. coli population on an agar plate. The clock hand, expression of mCherry gene, is driven by an “engine” which is constructed under the inspiration of the mechanism of action potential conduction in nerve cells. The engine consists of a positive feedback loop of AHL and negative feedback loops of TetR, AiiA and 2 types of artificial sRNA. We also designed UV reset devices using UV sensor construct. In addition, small RNAs were designed for metabolic engineering of E. coli, which is the first trial in iGEM competition. We show you the new and easy approach in genetic engineering with the BioBrick parts, which will lead to future application of sRNAs in synthetic biology.

WHU-China
Master of Regulation: dcas9-based Multi-stage Gene Expression Regulator
Track: New Application
Presentation: Lecture Theatre LT5 , Saturday, 10:30 AM
Poster: Poster area B, #38
Abstract: Cas9 is an RNA-guided dsDNA nuclease utilized by bacteria immune system. The genetically engineered Cas9 has recently been shown to have the ability to repress or activate desired gene expression. In practical research and industrial application, we usually face the problem to express a gene at different levels, not only “on” or “off ”, so a more flexible regulation method is needed. To achieve multi-stage regulation of target genes, we further develop several dCas9 devices in which dCas9 alone or fused with omega subunit of RNAP is directed by various guide RNAs to different regions of designed double promoters. Therefore, promoters with disparate strength can be either activated or repressed respectively and multi-stage gene expression can be achieved. Also, based on such novel technology platform, we are developing diverse applications such as a guide RNA-mediated oscillator.

XMU-China
A SynBio Oscillation Signal Converter
Track: Foundational Advance
Presentation: Lecture Theatre LT1 , Saturday, 9:30AM
Poster: Poster area B, #28
Abstract: Oscillations permeate every corner of the world, from the alternative current （AC） in power lines to our tiny microorganism friends. To use oscillations in bacteria as a strong and steady signal transmission method like AC, we need to tackle with the noise of transcription and translation in the cellular environment by coupling millions of cells through the synchronizing genetic oscillations in *E. coli*. At the colony level cells could be synchronized via quorum sensing, which is limited to tens of micrometers by the AHL, and between colonies a gas-phase redox (mainly H2O2) will serve as a signal that can give positive feedback to the whole circuit over millimeter scales simultaneously. On a liquid crystal display (LCD)-like microfluidic array bacteria grow in separate colonies, so that synchronization in both levels could be verified visually. Now a robust synthetic biology signal converter is accomplished and ready to show the growth environment of cells.

XMU_Software
Biobrick evaluation and optimization software suit and lab assistant tool
Track: Software Tools
Presentation: Lecture Theatre LT 1, Saturday, 4:30 PM
Poster: Poster area B, #23
Abstract: The biobrick evaluation and optimization software tool suit (Brick Worker) provide analysis of biobrick sequences, namely, promoter, RBS, protein coding sequence and terminator. We use PWM algorithm to evaluate the relative strength of promoters and RBS and precisely locate the key region of the sequence that affect its performance. Through codon optimization and GA algorithm our program can analyze and then optimize the protein coding sequence so as to enhance the protein expression level. Terminator efficiency prediction is also included in this suit. As for the lab assistant tool (E'Note), it is a powerful experimental recording platform with exhilarating functions such as multi-line operating, software tool integration and template customization, providing a all-round as well as customized tool to significantly enhance the efficiency of experimental work.

ZJU-China
A Tale of Aptamers: Ghost and Elf
Track: New Application
Presentation: Lecture Theatre LT1 , Saturday, 2:30 PM
Poster: Poster area C, #65
Abstract: This year we aim to utilize aptamer to specifically detect and clear molecules of different sizes. In order to detect and clear certain protein, we make tunneled *E. coli* called bacterial ghost that allow protein to diffuse in. We then build two types of inner-membrane protein scaffold, which will dimerize when pulled together by two aptamers attached to two sites of the protein. The dimerized proteins have enzymatic activity that can be detected via commercial test strips. The device will also sequester the proteins and allow us to clear them. In order to efficiently detect and clear a small molecule called atrazine, which is an herbicide causing tremendous environmental problems; we split our aptamer-based detection module and clear module into two strains. The first strain is chemotaxic to atrazine and will release quorum-sensing molecules to attract the second strain, which contains atrazine hydrolase to clear it.