iGEM 2014 High School Jamboree
Program Information

Acton-BoxboroughRHS
Project E. coli Luwak

Track: Food and Energy
Presentation: Room 32-141, 11:30AM
Poster: #28

Kopi Luwak coffee is the rarest and the most expensive type of coffee in the world, and is processed from feces of the Asian Palm Civet (Paradoxurus hermaphroditus). As the coffee berries are digested, bitter components of the coffee bean are broken down. Later, the beans are cleaned, roasted, and brewed to make the Kopi Luwak coffee. The problem with the procedure today is that farming industries keeps tens of thousands of civets living in battery cages, and force-feeds them only coffee berries. As a result of the treatment, the Asian Palm Civet population is declining. We propose to make this process humane, efficient, and sanitary by instead using bacteria to produce the coffee. We will accomplish this by genetically engineering E. coli with genes for various digestive enzymes, thus simulating the digestive process of the civets with coffee berries so we can finally save the Asian Palm Civets.

AUC TURKEY
DegradEColor

Track: Foundational Advance
Presentation: Room 34-101, 10:30AM
Poster: #17

Response systems possess great significance in the validation of designed systems in the current state of synthetic biology. This year we, team AUC Turkey, focused on the improving of response system. In our appraisal, we recognized that it would perhaps be easier to degrade dye instead of producing fluorescent proteins or pigments. In our new response system, the module will primarily be transparent and will change color according to enzyme activity thus creating a distinction between the initial and secondary modules. The process will allow a relatively faster response through the cleavage of the enzymes. The usage of different types of enzymes will result in differentiation in the cleavage and through the examination of the color; it will be possible to make find an equivalent match on the scale. DegradEcolor will be a fast response system as an alternative to the most popular response systems

Beijing HDFLS High
The UV-responsing tandem generators for a wintergreen odor and protective melittin.

Track: Health and Medicine
Presentation: Room 32-123, 2:00PM
Poster: #24

We design a bacteria that produces a wintergreen odor and protective melittin under extensive UV radiation. The biological system includes two generators: the UV-responsing wintergreen odor generator (BBa K994000) and UV-responsing melittin generator. The melittin generator is composed of two transcriptional devices: RecA (SOS) promoter (BBa J22106) and synthesized melittin gene with enterokinase digested sequence. The protective generator takes as input extensive UV radiation and produces as output fusion melittin. Melittin can improve immunity and scavenging free radicals to alleviate the harm from electromagnetic radiation, such as UV and blue light.

CAPS Kansas
Synthetic Production of Alkanes Derived from Yeast Pyruvate Kinase

Track: Food and Energy
Presentation: Room 32-141, 12:00PM
Poster: #11

Humans rely on carbon resources for nutrition and energy. Biofuels derived from corn-based ethanol and the microbial degradation of cellulose are not fully sustainable, due to the competition of food supply and expense of input energy. Cyanbacteria are bacteria with similar features as microalge in the sense that they are known to fix carbon dioxide into alkanes through the collective processes of photosynthesis, glycolysis, and fatty acid biosynthesis. The CAPS iGEM Team 2014 continues metabolic engineering of these pathways by expressing yeast-derived pyruvate kinase, known to be a key regulator of glycolysis, within the cyanobacteria Synechocystis PCC 6803 in an effort to increase alkane production. Assays for the production of pyruvate, fatty acids, and alkanes will be used to characterize our system. In addition, we will be determining various environmental conditions that increase the effectiveness of alkane production such as CO2 and O2 limitation.

Charlottesville RS
Polyhydroxybutyrate as a Substitute Source of Energy for Denitrifying Bacteria

Track: Environment
Presentation: Room 34-101, 2:30PM
Poster: #10

In Albemarle county, Virginia, a large amount of the waste water goes to and is processed in the Moores Creek Wastewater Treatment Plant. Each year, the plant purchases 250,000 dollars worth of glycerin, which is used by bacteria to denitrify the water, in order to prevent eutrophication in the Chesapeake Bay. The UVa iGEM team from 2008 created a part which, when added, enables E.Coli to produce polyhydroxybutyrate, a biodegradable, bio-derived plastic. Our project is to make E.Coli that produces this plastic, which the plant could then use this bacteria to create polyhydroxybutyrate, filter out the E Coli, and then use the plastic as an alternative food source for their bacteria, saving them 250,000 dollars per year, as well as giving them a renewable energy source for their plant.

CIDEB-UANL Mexico
E. CARU

Track: Environment
Presentation: Room 32-155, 3:00PM
Poster: #1

iGEM CIDEB 2014 team is project is a bio-filter of sodium ions in salt water. In order to work and test the different processes of the project, it was divided into four modules, which also made up the acronym of our projectís name: Capture, Aroma, Resistance, and Union. Capture module is in charge of recollecting sodium ions in the water due to the new NhaS gen registered by the team. Aroma module is with the help of salicylic acid, responsible of producing a Winter Green odor that acts as a reporter if the bio-filter is working. Resistance module allows the E. coli to survive in the salty environment of the water, and this allows the bio-filter to works. Finally, the Union module allow the bacterium to joins to a silica pearl, which facilitates the removal of the bacteria from the water.

CoBRA
CoBRA, Cochrane Alberta - Stopped In Their Little Blue Tracks

Track: Environment
Presentation: Room 32-141, 10:00AM
Poster: #29

While mountain pine beetle are a natural part of the southern Rocky Mountain ecosystem, recent beetle outbreaks are larger than those of the past. Decades of fire suppression have created large tracts of older pine forest that provide a highway for beetle expansion. The lack of fire, combined with a recent warming trend, means that the beetles are now occurring farther east, farther north and at higher elevations than ever before. This is cause for concern as the mountain national parks form the margin between the beetle outbreak in British Columbia and commercial forests in Alberta. Our project will focus on building a bacterial plasmid that will produce and secrete the chitinase enzyme which will in turn be able to break down the chitin rich membranes of the BSF while leaving the tree unaffected and thus able to use its own defences to deal with the mountain pine beetle.

Consort Alberta
ECOS (Environmental COntaminant Sensor)

Track: Environment
Presentation: Room 32-155, 2:00PM
Poster: #5

Our goal is to design and develop a construct that will detect levels of Xylene which is well correlated with the presence of carcinogenic benzene/benzene derivatives. During the extraction of petroleum, oil spills are a potential risk, and contaminated soil is harmful to the agricultural industry. Xylene is not overly harmful in the concentrations naturally found, however benzene derivatives related to xylene are, which is why we test for xylene in our lab. Our prototype will involve using alginate beads, which are porous. The matrix is big enough to contain e.coli, but small enough to prevent bacteria from escaping. The XylR transcriptional activator is a protein which in the presence of m-xylene will bind to the Pu promoter which activates the reporter genes. We are attempting to use two reporters: GFP and amilCP. We are evaluating which of these reporter genes are the most convenient and efficient to use.

CSIA-SouthKorea
Stop Desertification With Urease from Klebsiella oxytoca

Track: Environment
Presentation: Room 32-141, 9:30AM
Poster: #26

Our project presents a synthetic biology method for preventing this acceleration of desertification, trying do it based on the urease reaction, to change the dry soil to the CaCo3, which can ultimately concise the dry lands and also make a capsule to contain water. Using urease test with the strain Klebsiella oxytoca Kctc 1686, we checked out the different results between urease-contained strains and non-urease strains. The work presented here has profound implications for future studies of synthetic biology and might help to solve the problems of desertification. We are planning to use Klebsiella oxytoca and type of free nitrogen bacteria to settle the environment that plants could live. First, Klebsiella oxytoca is a bacterium with the ability to precipitate calcite and solidify sand given a calcium source and urea, through the process of microbiologically induced calcite precipitation or biological cementation.

CSWProteens
PlantiFreeze

Track: New Application
Presentation: Room 32-123, 12:30PM
Poster: #22

Frost damage to crops causes loses of billions of dollars annually. Currently, farmersí attempts to prevent frost damage are decidedly low-tech and only marginally effective. A synthetic biology solution to this problem is a spray-on slurry of a nonpathogenic strain of E. coli that covers the crop with a biofilm containing a secreted antifreeze protein (AFP). AFP's possess the ability to bind to the ice crystals on the plant surface, inhibiting the formation of ice. RiAFP refers to an AFP produced by the Rhagium inquisitor long horned beetle. This protein is particularly attractive for recombinant expression and biotechnological applications.

Elan Vital South Korea
Investigating multidrug resistance of MRSA and the genes involved

Track: Health and Medicine
Presentation: Room 32-123, 3:00PM
Poster: #7

Recently, the number of Staphylococcus aureus that shows resistance to drugs such as penicillin and ampicillin has increased. The purpose of the lab is to investigate multidrug resistance of Methicillin Resistant S. aureus (MRSA), and to identify the genes involved. We tested the resistance of the transformed E. coli in different antibiotics and could conclude that MRSA showed resistance to antibiotics. We were able to get an idea of which of the DNA were involved in the multidrug resistance. By running PCR, we were able to amplify the DNA involved, and by analyzing this, we could come up with a better understanding of how the multidrug resistance works. An appropriate follow up on the project would be to research the sequence of the identified genes with the hopes of finding a possible drug that destroys even the most MRSA.

FHS Frederick MD
Engineering an anaerobic indicator to monitor the health of microbial fuel cells

Track: Food and Energy
Presentation: Room 32-141, 2:30PM
Poster: #16

We’re seeking to create microbial fuel cells to experiment with genetic engineering and produce a clean source of energy and water. In order to fashion a more effective microbial fuel cell, we need to monitor the viability of bacteria within the fuel cell. Microbial fuel cells produce electricity and water when metal-breathing bacteria respire via an anode placed within an anaerobic compartment of the fuel cell. In order to monitor the health of these power-generating anaerobes, we designed an operon that will cause the microbes to fluoresce when growing in the oxygen-depleted anode chamber. Our operon consists of an oxygen-sensitive promoter, which activates gene expression in the absence of oxygen, and an open reading frame, which encodes a protein that fluoresces without the need for oxygen. This simple reporter system will allow us to determine when anaerobic conditions inside the fuel cell are optimal for bacteria growth and power generation.

GenetiX Tec CCM
Biodetection of Anoxia in Lake Xochimilco

Track: Environment
Presentation: Room 34-101, 11:30AM
Poster: #27

Lake Xochimilco in Mexico City faces a condition of extreme pollution which endangers the endemic species; many of which are near extinction. Oxygen levels depletion in the lake directly affect the flora and fauna, making it less hospitable or even deadly. Our goal is to produce a biosensor that can easily and inexpensively detect anoxia in different regions of the lake. Using an oxygen promoter in addition with the biological markers RFP and GFP we could theoretically detect low dissolved oxygen levels in water samples. In addition, we intend to use a second construct with an Iron promoter to detect iron concentrations that also endanger the sustainability of living organisms in the lake. Once we identify critical regions of the Lake, our report could incentivate Civil Council and authorities to propose concrete legal initiatives to reduce pollution in the identified areas and start remediation campaigns.

HTHS Trussville AL

The Development of a Phosphate Sensing Plasmid through the use of a Shuttle Vector in S. cerevaises

Track: Environment
Presentation: Room 34-101, 12:30PM
Poster: #37

The runoff of harmful chemicals such as phosphate into public water sources has increased, and this accumulation of chemicals in streams and lakes is harmful to the environment and aquatic life forms. Phosphate is a food source for algae and as phosphate levels increase, algae blooms increase and cover the surface of the water. This blocks sunlight energy from reaching the bottom of the river. This research aims to create a biological plasmid to test for phosphate in a sample of water. The plasmid will be inserted in yeast, S. cerevaise, which contains an outer membrane sensor for phosphate. The sensor signals to the cell whether or not there is phosphate present. If phosphate is present, then the yeast utilizes it; if not, the external sensor initiates the phosphate starvation pathway in which the Pho4 protein to binds to the PHO5 gene. The plasmid that will be inserted into S. cerevaise will contain the genetic sequence for the PHO5 promoter and red florescent protein (RFP). If the biological test is surrounded by high levels of phosphate, then the PHO5 gene will not be activated and the system will be colorless. If the environment is low in phosphate, the Pho4 protein will bind to the PHO5 promoter and cause the system to turn red. The plasmid serves as a qualitative and quantitative method to test for the presence of phosphate in a water sample, which in turn creates a biological mechanism that is not hazardous to monitor levels of phosphate.

HUNGENIOUS

Developing a protective probiotic bacteria against Crohn's disease

Track: Health and Medicine
Presentation: Room 32-123, 10:30AM
Poster: #6

Crohn’s disease is a type of inflammatory bowel disease. The exact etiology is still unknown, but it seems, it can be caused by foul ways of living, smoking and genetics can also play a big role in it. It is scientifically proven, that N-acetylglucosamine (NAG) has tissue repairing effects[1]. So we searched for an extracellular enzyme that can break down chitin into oligomers. We found a former iGEM team (Kyoto 2011), that designed a BioBrick (BBa_K622006), that is very similar to our needs, but unfortunately their chitinase gene did not work. Then we have discovered in a Brazilian article[2] with an efficient secretion of a functional chitinase from Chromobacterium violaceum in Escherichia coliOur aim is to use a genetically modified probiotic bacteria transformed with this chitinase gene to break down chitin into oligomers. These oligomers are expected to be digested further to NAG by the enzymes of intestinal tract cells.

Jefferson VA SciCOS

Solving a 4-Node Traveling Salesman Problem Using the hin/hixC Recombinant System

Track: Information Processing
Presentation: Room 32-123, 11:30AM
Poster: #25

Bacterial computing has become a feasible way to autonomously solve quantitative problems. We sought to utilize the computational capacity of E.coli K-12 to solve the Traveling Salesman Problem, a problem in theoretical computer science that asks for the shortest possible route that visits each node in a system at least once and returns to the original node. We utilized a series of initial configurations for the hin/hixC recombinant system that were previously developed by a 2006 iGEM team to solve the Hamiltonian Path Problem. In addition, we created a fourth node by splitting blue fluorescent protein (BFP) with a hixC site and reinserted this node into one of the composite hin/hixC paths. To simulate varied distance, we added a ribosome binding site of a different strength in between the initial recombinant system and the fourth node.

Lambert GA

Chitinite: Defending Fruit One Gene at a Time

Track: Manufacturing
Presentation: Room 32-155, 12:00PM
Poster: #31

Chitin, a polysaccharide derived from glucose, is commonly found in the cell walls of fungi and the exoskeletons of organisms. Chitosan is derived from chitin through the N-deacetylation process. Uses include agriculture, medicine, and industry. Research in our local community led us to research applying chitosan in an agriculture setting by preserving post harvest fruit from fungal infections. Current technology to produce chitosan involves a caustic chemical process that is detrimental to the environment. An alkali sodium hydroxide removes the acetyl group from chitin to produce chitosan. Fortunately, this conversion process also takes place in the natural environment in a multitude of organisms through the aid of an enzyme called chitin deacetylase, or CDA. The main focus of our project was to obtain a CDA gene from a eukaryotic source, engineer a suitable vector with promoter, and transform into a bacterial host using the standard Biobrick assembly.

Lethbridge Canada

A Synthetic Biology Approach to Preventing Increasing Antibiotic Resistance

Track: Environment
Presentation: Room 32-155, 10:00AM
Poster: #18

In April 2014, the World Health Organization released a report about the increasing danger of antibiotic resistance stating ìA post-antibiotic era ñ in which common infections and minor injuries can kill ... is a very real possibility for the 21st century.î People continue to misuse antibiotics by not finishing their prescription, using them to combat inappropriate pathogens like viruses, and using them liberally in agriculture. When this happens, antibiotics can enter the water table. This selective pressure causes organisms in the water to adapt and become resistant to the antibiotics. Reducing the amount of antibiotics in the water supply will help to reduce this selective pressure. To remediate antibiotics in the environment we plan to generate a strain of E. coli that will export an enzyme known as Beta-lactamase to degrade Beta-lactam antibiotics. Ultimately, this will help reduce the selective pressure causing the evolution for antibiotic resistance.

METUHS-Ankara

CO to CO2 Converter & CO Monitoring System

Track: Environment
Presentation: Room 34-101, 3:00PM
Poster: #2

Carbon monoxide is a highly toxic gas which is undetectable by humans and it is fatal when inhaled. Weíve developed a biological device that comprises of both a qualitative detector for this dangerous gas and a conversion system to transform it into carbon dioxide. As for detection, CO sensitive promoters pCooM and pCooF from Rhodosprillum rubrum will initiate the production of fluorescent proteins in the presence of CO. Optic sensors will be used to track the production of these proteins and if the sensors pick up data indicating that CO is present; an alarm will be triggered. Meanwhile, the conversion system of our device will utilize a Cyanobacteria enzyme called Carbon Monoxide Dehydrogenase (CODH), which converts CO into CO2. We also have a kill-switch design based on the lac-operon. The kill-switch mechanism will be activated to avoid any contamination of the environment, in case the altered bacteria escape the device.

Mingdao
Odor - Let it die

Track: Environment
Presentation: Room 32-155, 9:30AM
Poster: #32

Food wastes can be recycled as fertilizers but leaving strong odors (e.g., NH3, H2S, etc.) from metabolizing by food spoilage bacteria. Antimicrobial peptides (AMPs) with effect against bacteria, viruses and fungi are small, cationic peptides that bind anionic membrane surfaces of microbes, resulting in forming channels or pores and leaking cell contents.

Stenotrophomonas maltophilia is an environmental bacterium with beneficial effects for plant growth. Several extracellular proteins such as proteases, lipases, nucleases, chitinases and elastases have been identified as decomposing enzymes. In the design of our genetically engineered bacteria, weíve created biobricks of (1) AMPs (cecropin and magainin) to attack spoilage bacteria, and (2) several secreted decomposing enzymes directed by the secretion signal of E. coli OmpA to enhance the digestion of food wastes, as well as set (3) a self-destructive device inside to sacrifice when completing the mission, in which ccdB lethal gene expression is regulated by light.

Montgomery Cougars NJUSA
Acne Vulgaris Prevention through Dehydrogenation of Sebaceous Lipids

Track: Health and Medicine
Presentation: Room 32-123, 2:30PM
Poster: #4

Acne vulgaris affects around 85% of American adolescents. The four main causes of acne are comedogenesis, sebum production, proliferation of Propionibacterium acnes, and inflammation in the form of papules, pustules, and nodules. Triglycerides, wax esters, squalene, free fatty acids, and sapienic acid are the main components of sebum. Our team has created a biosystem that reduces the presence of sebaceous components (primarily wax esters). Our mechanism includes two proteins of interest-Medium Chain Alcohol Dehydrogenase and Medium Chain Aldehyde Dehydrogenase in two identical biological circuits to change the structure of wax esters and other lipids, rendering them insufficient for bacterial consumption. We included a basic promoter, RBS and terminator, making the protein-coding domain the only variable between the two circuits. We hope this mechanism facilitates sebum breakdown and reduces inflammatory responses of the P. acne bacteria.

Nanjing NFLS
CRISPR-Cas9 gene editing kit in eukaryotic cells

Track: Foundational Advance
Presentation: Room 34-101, 9:30AM
Poster: #35

Utilizing the unique features of CRISPR-Cas9 system, our team developed a gene editing tool kit that can be effectively used in eukaryotic cells. Comparing to the traditional approach that relies upon restriction enzymes, a CRISPR-Cas9 based system offers several advantages including greater flexibility in silencing, enhancing or repairing gene expression, and the ability to introduce larger gene fragments. Our gene editing kit has three components: Guide RNA (gRNA), outer membrane protein of TMV homologous DNA sequences and CRISPR-Cas9 enzyme. The system was designed to have great compatibility with a wide range of organisms and easy to work with, and has been preliminarily validated by plasmid transfection in CHO cell line. With iGEM database in mind, the kit follows a modular design and aims to future iGEM projects with greater flexibility and compatibility in gene editing.

NGSS TR
S. Diagenes

Track: Health and Medicine
Presentation: Room 32-123, 9:30AM
Poster: #19

Streptocccus Pyogenes is a severe bacteria which can result in some ilnesses such as pharyngitis. Diagnosis of S. Pyogenes can be done in some ways. However some ways are fairly expensive or takes more than a day to detect. We designed our system to solve this problem by using synbio. We simply found the sequence which can be cleavaged by the protease, SpeB, secreted by S. Pyogenes. In our system we used a wall protein which is linked to cleavage site by a sequence of linker. On the other side of the cleavage site, we located Catechol 2,3-dioxygenase(C2,3O) monomer. When cleavage site is eradicated by SpeB, free C2,3Os form tetramers. Catechol is a substance that reacts with Oxygene. As a result of this reaction yellow colour is produced. This system is fairly fast in comparison to blood agar method. The system can also be modified to detect other demerit bacteria.

OLS Canmore AB CA
Heat-induced Olfactory Biosensor

Track: Foundational Advance
Presentation: Room 34-101, 10:00AM
Poster: #23

As Our Lady of the Snowís first iGEM team, we have decided upon creating a heat-induced olfactory biosensor using E. coli as a chassis. Constructed by placing a wintergreen odor enzyme generator downstream from a heat sensitive promoter, the bacteria should emit a noticeable wintergreen smell starting near a human body temperature of 37°C. As the temperature increases the heat sensitive promoter gradually decreases the effect of the repressor to allow for maximum wintergreen enzyme generation around 42°C. The creation of this biobrick will serve as a first step towards a multiple input bio-sensing system. Such a system may include the input of heat and different wavelengths for activation. Both pursuits will help achieve the goal of using bacteria in increasingly complex circuits to more effectively sense the environment.

PEA Exeter NH
Development of Fracking Runoff Detectors

Track: Environment
Presentation: Room 34-101, 12:00PM
Poster: #34

Our team's primary goal is to create a cell that can detect naphthalene (a toxic chemical often found in fracking runoff) and degrade it to a less harmful compound. We used a nahR gene, on plasmid NAH7 (BBa J61051), which breaks down naphthalene in a cell environment into the more inert catechol. We then use the downstream element BBa K118021, whose protein product, catechol-2, 3-dioxygenase, catalyzes the conversion of catechol to 2-HMS (2-hydroxymuconate semialdyhyde) a yellow-colored molecule. In addition, we created a cell that will be able to broadly identify other toxic fracking byproducts via a nonspecific SOS cell damage element. The promoter recognizes and binds to a combination of sequences of SOS repressor proteins produced after cellular stress from damaging toxins or radiation. This promoter (BBa K518010) will be attached to a downstream element (BBa K592009) coding for a blue-colored protein, so that bacterial cells exhibiting stress can be easily discerned.

RAMNOTIREN CALGARY

Track: Health and Medicine
Presentation: Room 32-155, 11:30AM
Poster: #13

Ravenwood Raptors
Engineering Production of Therapeutic Sage Terpenoids

Track: Environment
Presentation: Room 34-101, 2:00PM
Poster: #9

The sage plant Slavia officinalis produces terpenoids that have several medicinal applications including recently-reported antifungal activity. But extraction and purification of these terpenoids from sage on the commercial scale is difficult and expensive. We propose to improve production by transferring the terpenoid synthesis pathway into Escherichia coli and yeast. An important enzyme in the terpenoid pathway is bornyl diphosphate synthetase, so we designed primers for amplifying its gene by PCR, cloning in E. coli then protein over-expression in yeast. Unfortunately, our PCR reactions did not produce prominent, gene-sized, gel bands, perhaps due to long intron sequences. We thus plan to use the same primers for cloning the mRNA as a BioBrick by reverse transcription into cDNA, thereby enabling protein over-expression in either E. coli or yeast.

Shasta Summit CA

Track: Environment
Presentation: Room 32-141, 10:30AM
Poster: #3

Shenzhen SFLS
Ludagunr

Track: Food and Energy
Presentation: Room 32-141, 12:30PM
Poster: #15

Our project is named as Ludagunr, whose chinese meaning is a kind of traditional snacks from China.

Aflatoxin is a highly toxic substance which exists on grains. The most poisonous kind of aflatoxin is Aflatoxin B1 (AFB1).

Since it is difficult to degrade the toxin, we decided to use ScFv (single chain variable region fragments), an antibody, to neutralize it. We used ScFv to neutralize AFB1 because it has been used before and its molecular modification is easy.

We used ScFv, SH3 ligand and 6*his-tag to construct fusion protein so that it can combine with SH3 domain. In this way we can use cells to recover the ScFv that have been expressed out to reduce the antibody-antigen complex that exists on grains. We anchored SH3 domain on E.coli's cell membrane LGT to recover the ScFv.

Keywords: AflatoxinB1(AFB1),ScFv, SH3 ligand, SH3 domain, LGT</p>

Shenzhen SZMS
E. coli Plant-sitter

Track: Food and Energy
Presentation: Room 32-141, 3:30PM
Poster: #21

Our project is to create an “E. coli Plant-sitter” that achieves smart maintenance of healthy plant growth through the application of synthetic biology to temperature moderation. We hope that our toolkit will simplify the process of plant cultivation and make synthetic biology accessible to peopleís daily life. Hothouse plants whose preferential temperature ranges from 25~30° are exposed to the threat of low productivity and unhealthy growth in overly cold environments. Therefore, we came up with a system that aids the healthy growth of these plants by protecting them from overly low temperatures through smart temperature control. Our system of temperature moderation, including temperature sensing and temperature regulating, is able to produce heat once the temperature drops below 27° and stops heating when the temperature reaches 27~28°. In this way, the temperature is to be kept at 27°, ensuring the healthy growth and high productivity of hothouse plants.

SKLBC-China
WeIGEM+: A SNS-based Platform for iGEM

Track: Information Processing
Presentation: Room 32-123, 12:00PM
Poster: #33

With the development of technology, the use of biobrick has been widen. However, it is not easy to find out the right one in thousands of biobricks. We have been dreaming a bioinformatics solution. Here comes the WeiGEM+, Wechat plus iGEM, which is a multi-functional public account that includes BioBrick search engine and iGEM articles. Biobrick search engine can be a useful tool for IGEM participants. With the Catalogs in the WeiGEM, users can search the ideal BioBricks by typing key characteristics in the text box. The science popularization part contains instant news on advanced science, including synthetic biology, life technology and brief introduction on previous works in iGEM and so on. Besides, human partice such as iGEM China meetup has been held by us in our region. With WeiGEM, synthetic biology can be spread to the global world and this can be a new way for leading science popularization.

SMTexas
VOColi: Detecting Lung Cancer Biomarkers

Track: Health and Medicine
Presentation: Room 32-123, 10:00AM
Poster: #12

Inspired by the olfactory ability of canines to detect diseases, we will pursue a long-term project that revolves around the creation of a minimally invasive and inexpensive detection system for lung cancer, through the identification of exhaled biomarkers. Lung cancer is the leading cause of cancer-related death around the world. Twenty-two volatile organic compounds (VOCs) have been distinctly found in the breath of affected patients, creating a viable ìfingerprintî for reliable detection (Horvath et al.). This year we focused on creating biosensors for three VOCs: ethanol, formaldehyde, and xylene. We plan to create genetic circuit systems for aldB induced by ethanol, frmR recognition of formaldehyde, and xylR activated by xylene. Our current device will utilize three reporter proteins (CFP, GFP, RFP) to indicate the concentrations of the three VOCs present in an exhaled sample. This research will eventually go into creating a conclusive test for use in the developing world.

StuyGem NYC
Wanted: Bacteria. Dead or Dead

Track: Environment
Presentation: Room 32-155, 10:30AM
Poster: #36

There is a public fear of genetically modified organisms (GMOs) and their escape from the laboratory environment into the outside environment. Our project will quell the fears of the general public and increase support for synthetic biology by introducing a safety mechanism - a kill switch. The team will build this kill switch with constructs consisting of a “kill gene” - a naturally occurring toxin: ccdB, a riboregulatory system, and a UV light inducible promoter. We plan on testing the riboregulatory system for efficiency of cell death. The success of inducible cell death would revolutionize the control over the unintended dispersion of GMOs.

TAS Taipei

E. mortality: Extending Cell Life by Regulating Telomere Length

Track: Health and Medicine
Presentation: Room 32-123, 3:30PM
Poster: #8

Telomeres are repeating sequences of TTAGGG nucleotides at the ends of somatic cell chromosomes. These sequences protect cellular genomes from harmful effects associated with chromosome shortening during cell replication. Due to the finite length of telomeres, telomere shortening is known to be a primary contributor to cellular senescence and cell death. To allow human somatic cells to replicate indefinitely, we have engineered a biological circuit with three primary components to regulate telomere length. (1) Expression of the reverse transcriptase enzyme telomerase to extend telomeres (2) Regulation of the amount of telomerase expressed using an oscillatory mechanism (3) Operation of a safety device to prevent possible cancerogenesis. Through the cooperation of these three mechanisms, and the tools of synthetic biology, lifespan extension is possible.

TP CC-SanDiego

Engineering E. Coli Capable Of Extracellular Secretion Of Mycotoxin Detoxifying Enzymes

Track: Food and Energy
Presentation: Room 32-141, 2:00PM
Poster: #30

Microfungi that produce harmful mycotoxins flourish on improperly-stored nuts, grains, meat, and dairy. They especially thrive in developing countries, where the lack of advanced food storage and mycotoxin exposure causes 40% of the diseases. To lessen the problem, our team engineered E. coli strains using synthetic biology tools to produce chimeric mycotoxin-degrading fungal enzymes, Aflatoxin-Detoxifizyme (ADTZ) and Zearalenone Hydrolase (ZHD101), which are designed to be secreted to extra-cellular space by fusing with secretion signal peptides from alpha-amylase and beta-lactamase. In this study, we have successfully generated synthetic genetic materials to produce four chimeric mycotoxin-detoxifying enzymes. The levels of extracellular secretion is also characterized and analyzed. The project will allow a mass production of detoxification enzymes in cost effective way, preventing the squandering of harvested crops, and limiting mycotoxin-related diseases. Increased access to these proteins will have an immense commercial, industrial, agricultural, and health impact.

UCL Academy

Bio-purification of water to remove bio-toxins: Bio-IN, Bio-OUT.

Track: Environment
Presentation: Room 32-155, 2:30PM
Poster: #20

The project aims is to degrade microcystin, a toxic substance produced by cyanobacteria. When cyanobacteria die, the cell walls collapse, causing the release of microcystins into water. However, microcystins happen to be extremely stable, so this means they are able to resist common chemical breakdown, such as hydrolysis, at natural conditions. It also breaks down very slowly at high temperatures (40∞C), so the best way to deal with the problem is to use a bacterium that can break it down. However they arenít usually found in water, so this allows the toxin to ravage the aquatic ecosystem. Our idea is to make a genetically modified organism that can break down microcystins. So, we will modify an E.coli bacterium to float at the top of a water column, where the cyanobacteria are located and to detect and degrade microcystins.

WalthamHS BioHawks

Stain Removers: Creating an Environmentally Friendly Alternative

Track: Manufacturing
Presentation: Room 32-155, 12:30PM
Poster: #14

For the Biohawks iGEM team, our primary goal is to develop an organic, safe stain remover for commonplace applications. By transforming bacteria to manufacture an enzyme that breaks down common proteins, we hope to present a new alternative to marketed removal products, which contain harsh chemicals. In theory, many enzymes could be used, varying in function to break-down different molecules such as cellulose in plant-based stains, lipids in oil stains, starches in condiment stains, and so on. However, not all enzymes can be used, as the integrity of the clothing must be preserved and the user must be kept safe from harm. Some enzymes or solutions can cause epidermal damage or respiratory problems. Our goal, using the enzyme subtilisin, is to remove protein-based stains and create a substitute for potent chemicals with a green solution for the 21st century.