FROM THE LAB

Current Research at Cooper

FEBRUARY 18, 2016

BIOENGINEERING

Room 704

Extraction and Analysis of Farnesol in Korean Rice Wine (Makgeolli)
Jiwoon Park
Advisor: Prof. Ruben Savizky

Makgeolli is a traditional Korean rice wine. It is made with nuruk, a saccharified rice starch, and yeast as a fermenting agent. As various anticancer agents are discovered from common food sources, researchers have been looking for the ways to extract their compounds and utilize them. Among various anticancer agents, the research primarily aims to utilize farnesol, a 15-carbon organic compound that is known to have chemopreventive and anticancer effects. The goal was to optimize the farnesol extraction process specifically in Makgeolli.

Enhancement of Gene Targeting in Mammalian Cells
Nicholas Gao
Advisor: Prof. Oliver Medvedik

The latest method for gene editing takes advantage of CRISPR/Cas9 to introduce a double-stranded break at a precise location within a genome, creating a customizable DNA cutter. Homologous recombination can introduce a desired sequence into the location of the break to make a repair. The rate and precision at which homologous recombination occurs can be maximized, leading to drastic improvements in the field of gene therapy.

“Loomino”: De Novo Synthesis with Terminal Deoxynucleotidyl Transferase
Tushar Nichakawade, Yingfu Ma
Advisor: Prof. Oliver Medvedik

This version of in-vitro DNA synthesis relies on the use of an enzyme, TdT, in aqueous solution, rather than the current methods requiring solid phase organic chemistry (phosphoramidite) and organic solvents. The current technology for gene synthesis also necessitates outsourcing work to companies due to the specialized equipment involved. Our system uses the naturally occurring TdT enzyme to controllably add any of the four typical nucleotides, A, T, G and C, to the ends of DNA molecules. Having the flexibility to synthesize DNA directly at the lab bench will thus greatly expedite genetic engineering.

A Dual Plasmid Based System for Genetic Engineering in Bacteria
Scott Kulm
Advisor: Prof. Oliver Medvedik

Plasmids are double-stranded DNA molecules present in bacteria and separate from chromosomal DNA. They can be a useful tool for copying or altering DNA. This project, intended to provide high school students with a cheap and easy-to-use method for exploring genetic engineering, expands existing systems that combine genes from two plasmids to now introduce multiple genes. The result will be a more sophisticated modeling system for students to use.

FROM THE LAB

Room 706

Biaxial Cell-Stretching Bioreactor for Tissue Culture
Joe Viola, Willfrido Castillo, Michael Ahn
Advisor: Prof. Eric Lima

A bioreactor that simulates the biaxial stretching of cells was analyzed and revised in order to improve reliability and usability. That process requires precision to a fraction of a millimeter, so the geometry of the existing device was analyzed and possible error due to component and manufacturing tolerances was specified.

Metagenomic Sequence Analyses of Beehive Microbiomes
Devora Najjar
Advisors: Prof. Christopher Mason (Weill-Cornell Medical School) and Prof. Kevin Slavin (M.I.T. Media Lab)

This project is a study in the scientific and cultural implications of urban microbiome visualization by conducting a metagenomic analysis of urban apiaries. Samples of honey, beeswax, propolis, bee debris, whole bees, as well as swabs of the inside and outside of the hives were taken from four different hives in three different locations in the New York City area and their DNA was sequenced. The results were used to determine the uniqueness of each hive and further inform how a beehive functions on a microbial level.

Room 609

Observation and Modeling of Magnetic Nanoparticles as a Means for Targeting Anti-Cancer Drugs
Andrew Wentzel
Advisor: Prof. Phil Yecko

One method being explored to deliver drugs directly to sites of tumor growth is through the use of magnetic nanoparticles as a drug delivery vehicle via the bloodstream. A flow apparatus has been designed and built that will allow us to perform our own in-house particle imaging velocimetry (PIV), using laser and LED illumination of suspended nanoparticles. This will enable us to better model the behavior of these particles in a patient's bloodstream.

Room LL201

Bioremediation of Gasoline Spills above Simulated Shallow Aquifer
Peter Wang, Hailey Kim, Kirsten Ondris, Jean-Dominique Bonnet, William Yang
Advisor: Prof. Constantine Yapijakis

Bioremediation of gasoline spills in soil above shallow aquifers will be experimentally investigated through the use of soil columns. Different magnitudes of gasoline spills will be simulated, as well as the case where residual gasoline is already in the soil. A blend of petroleum-consuming bacteria will be applied in dosages to the contaminated soil to mitigate the contamination of the simulated aquifer. Experimental parameters will be optimized to obtain the greatest toxicity reduction and petroleum hydrocarbon reduction in the leachate samples.