Undergraduate Research Symposium May 17, 2013 Mary Gates Hall

Online Proceedings

SESSION 2Q

INTERSECTIONS: ART, CULTURE, TECHNOLOGY, PHYSICALITY

Session Moderator: Jennifer Salk, Dance

389 MGH

3:45 PM to 5:15 PM

* Note: Titles in order of presentation.

The Jazz Aesthetics of Light Gloving

Paul Eschbach, Sophomore, Philosophy, Whitman College
Mentor: Keith Raether, Office of Fellowships and Grants, Whitman College

”Gloving” or ”light-gloving” is the art of manipulating light by means of the hands. Typically, LED microlights are affixed to stretch gloves. The placement of lights on the gloves varies; thumb lights and palm lights are optional. My multimedia presentation links the improvisational movement techniques of light-gloving to the improvisational lines, digressions and interpolations a jazz musician introduces and explores in a solo. In the video portion of my presentation, I and Tom Shellum each take ”solos” using light glove techniques on the composition, ”Rear Control,” by a quartet led by drummer Matt Wilson. Our independent styles of light-gloving are much like the independent lines of improvisation between one jazz musician and another. Each of us picks up on different cues from the music. We are improvising on improvisation. Light-gloving is, after all, an improvisational art form; like jazz, its essence is found in spontaneous creation.

POSTER SESSION 4

Commons West, Easel 38

4:15 PM to 5:45 PM

Triage Project

Padmavathy Nageshbabu (Padma) Vaithyam, Senior, Informatics (Human-Computer Interaction), Informatics (Information Architecture)
Diana Jiang, Senior, Informatics
Neeraja Duriseti, Senior, Informatics, Applied & Computational Mathematical Sciences (Engineering & Physical)
Bryan Keith Phillips, Senior, Anthropology: Medical Anth & Global Hlth
Mentor: Bryan Keith Phillips, Anthropology

Nearly half of the US population is living with a chronic disease. A chronic disease is a prolonged illness that cannot be spontaneously resolved and can rarely be cured completely. Chronically ill patients feel more resentful, isolated, and prone to depression, stress, and anxiety; known factors which diminish a patient’s health. Studies indicate that support groups help patients to alleviate stress, depression, and cope with their illnesses. Currently there are many online support groups that help connect fellow patients of a chronic disease with each other while medical tools like WebMD help connect patients to an expert (not necessarily the patient’s own doctor). Triage is a system we are designing to bring together these connection mediums and provide chronic disease patients with a communication hub where they can connect with fellow patients, their own doctors, and researchers. Patients can share with fellow patients their personal journeys through the chronic disease, become friends with them, form groups, and view top posts from other patients. Patient to doctor communication will entail quick questions to the patient’s doctor, and short messages to the doctor that could easily answered without an appointment. Patients can also interact with researchers of their particular chronic disease who are looking for participants for their studies, can participate in studies, and get updates about new research in the field. Multiple usability tests will be conducted involving doctors, patients and researchers to evaluate and improve the overall design of the Triage project.

POSTER SESSION 4

MGH 241, Easel 158

4:15 PM to 5:45 PM

Alteration of Homing Endonuclease Recognition Site to Target Latent HBV Infection

Kevin Tze Chi (Kevin) Kwong, Junior, Biochemistry
Mentor: Nick Weber, Laboratory Medicine
Mentor: Keith Jerome, Laboratory Medicine

There are currently an estimated 350 million people worldwide chronically infected with the Hepatitis B virus (HBV). These individuals, over the course of their life, are at an increased risk of developing liver cancer. While antiviral drugs can suppress HBV replication, latent HBV viruses, lying dormant but still potent in the hosts' cells, so far have proven difficult to eradicate. Homing endonucleases (HE), enzymes that recognize long DNA sequences and induce DNA double strand breaks, could be a means to target and inactivate latent HBV. In particular, we aim to modify the recognition site of the WT I-GzeII homing endonuclease specific to the HBV genome and introduce DNA double-strand breaks. By exploiting the error prone nature of non-homologous end joining, the cellular process to repair double-strand breaks, these modified HEs will have a mutagenic effect on target sequences. Repeated HE activity will eventually cripple the replicative ability of latent viruses. To selectively modify the structure of homing endonucleases, a variant library of the I-GzeII gene is generated with randomized bases corresponding to the amino acid residues that interact with the DNA substrate. Variants that encoded for active HEs with the appropriate recognition site are selected for by In Vitro Compartmentalization (IVC). The selected variants will then be run through bacterial selection and in vitro cleavage assays to further select for structurally stable variants that function in vitro. The final step is to test the HE product on an in vitro HBV cell line. Through our research, we hope to prove that the target of I-GzeII recognition sites can be effectively altered and that latent viruses can be targeted and inactivated through mutagenesis by homing endonucleases. Hopefully, our research will be the first step to a more permanent cure for HBV infections and help to reduce incidences of liver cancer.

POSTER SESSION 4

MGH 241, Easel 151

4:15 PM to 5:45 PM

Vectorizing DNA Cutting Enzymes for Targeted Provirus Mutagenesis in HIV Therapy

Harlan Linver (Harlan) Pietz, Senior, Microbiology
Mentor: Daniel Stone, VIDD
Mentor: Keith Jerome, Laboratory Medicine

Thirty-four million people worldwide currently live with HIV-1. Despite the availability of highly-active antiretroviral therapy (HAART) which may prolong the lifespan of HIV patients, HAART does not target the latent viral reservoir in infected cells, enabling viral rebound in the absence of treatment. Introducing genetically-engineered DNA cutting enzymes (endonucleases) into HIV-infected cells may disrupt the integrated provirus. The site-specific DNA cutting activity of these endonucleases operating in conjunction with cellular error-prone DNA repair mechanisms may result in sustained damage to the integrated viral genome and prevent the virus from replicating. We are investigating 3 classes of engineered endonucleases: homing endonucleases (HEs), zinc finger nucleases (ZFNs) and transcriptional activator-like effector nucleases (TALENS). While the large DNA-binding domains of these endonucleases allow for customization to a desired target sequence, delivering these enzymes to a cell (vectorization) poses a challenge. TALENS in particular require a DNA coding sequence beyond the capacity of many viral vectors. As such, a method of co-transduction must be pursued, whereby two halves of the endonuclease coding sequence are delivered by separate viral vectors and coordinately expressed in the HIV-infected cell. My project aims to determine the optimal multiplicity of infection (MOI) for co-transducing HIV-infected cells using adeno-associated virus (AAV) vectors. I have determined AAV-1 to be the optimal serotype of AAV for infecting SupT1 cells, a cell line used as a model for HIV-infected T-cells. I have constructed two sets of AAV-1 viral vectors to express either Green Fluorescent Protein (GFP) or a red fluorescent protein (mCherry) as surrogates for endonuclease genes and infected SupT1 cells with both sets of vectors at variable MOIs, using flow cytometry to determine the rate of co-transduction. Through this method, I have successfully co-transduced cells with two AAV-1 viral vectors. These results may have applications in future HIV research and clinical therapy.