ITHS and WRF Summer Commercialization Fellowship Projects 2018

1. Macrocycles

UW Principal Investigators: Lance Stewart and David Baker
Department: UW Institute for Protein Design, Biochemistry
UW CoMotion Technology Manager: Dennis Hanson

The Institute for Protein Design has, in the last year, made major breakthroughs in the computational design of small stable peptides and macrocycles that represent a totally new class of drug molecules that have the best properties of both small molecule drugs like aspirin and large biologics like antibodies. We believe these new computationally designed peptides, which can be designed to order with atomic level accuracy to target other proteins, will be the basis for an entire new class of drug substances. In order to ensure that this becomes a reality, we need to carefully think through where best to apply this powerful new design capability.

A team of 4 people will be partnered with the WRF ITHS fellow to mentor them through a target vetting process on where best to apply this new technology. We will likely pick one target area and build a full net present valuation model for that area of application to ensure that it is a valuable endeavor.

2. LuxSonics

UW Principal Investigators: Ivan Pelivanov and Matt O'Donnell
Department: UW Bioengineering
UW CoMotion Technology Manager: Roi Eisenkot

We have recently demonstrated that non-contact photoacoustic (PA) measurements can provide scatter-insensitive molecular fingerprinting in complex samples. If successful, this highly disruptive technology can be extended to the microscale and become the core of label-free PA flow cytometry and histology (molecularly fingerprinting single cells and potentially sub-cellular structures) – two major market opportunities – as well as a new family of instruments addressing the grand challenge of noninvasive molecular fingerprinting within complex structures.

This project is ideal for a summer fellow interested in assessing all possible markets for the technology, investigating FDA regulatory pathways, identifying potential commercial partners, and helping develop the first draft of a business strategy to bring this disruptive technology into commercial use.

3. Versan™ Wound Healing Product

Benaroya Research Institute Principal Investigators: Ingrid Harten and Tom Wight
Department: Benaroya Research Institute, Matrexa
Technology Manager: Bolong Cao

Ingrid Harten engineered the very difficult to make extracellular matrix protein (V3 isoform of versican) with anti-inflammatory property. The protein can be used for wound healing and scar reduction, one of many potential therapeutic applications. The Versan™ wound healing product is an extracellular matrix (ECM)-based therapeutic being jointly developed by The Benaroya Research Institute (BRI) and spin-out Matrexa LLC, under the leadership of the Director of Matrix Biology Program at BRI. Chronic wounds, such as diabetic, venous, and pressure ulcers, affect over 6 million people in the US alone. This number is expected to grow as our population ages.

Our summer fellow would compare and contrast dermal application options, conduct an analysis of the competitive landscape, and recommend the best quick-to-market strategies, including cosmetic applications.

4. Chimerocyte Diagnostics

Fed Hutch Principal Investigators: J Lee Nelson and Sammy Kanaan
Departments: Fred Hutchinson Cancer Research Center
Technology Manager: Patrick Shelby

Patients with blood cancers such as leukemia who are chemotherapy-resistant or are relapsing are often candidates for stem cell therapies. These patients are monitored by identifying biomarkers associated with the underlying disease, which can predict relapse. In some patients suitable biomarkers are lacking. In these cases chimerism analysis can substitute in place of an appropriate a biomarker. The objective is to develop the technology providing in-house services and creating a commercialized kit allowing highly sensitive quantitative chimerism testing for use in clinical diagnostics, as well as for scientific research.

We have a start-up that is in the early-formation stage called Chimerocyte. This is a fantastic team of J. Lee Nelson (one of our senior faculty members) and her outstanding postdoc Sami Kanaan. Sami is planning to spin out with the company and they have applied for STTR funding.

The needs include: 1) target market analysis, 2) competitive analysis, 3) financial analysis and formation of financials for investor presentations.

5. ORBIS Operating Room Business Intelligence System

UW Principal Investigators: Bala Nair
Department: UW Medicine, Anesthesiology and Pain Medicine
Technology Transfer contact: Laura Dorsey

Operating rooms in hospitals consume 40% of total expenses, and account for 50% of the revenue. Yet, there is a struggle to understand what is going on in operating rooms real time and also retrospectively. While this sounds obvious and straightforward, even something as simple as knowing how often an individual surgeon starts their first surgery of the day late is not information that is readily available, but has a large impact on the efficiency of the entire operation. We have developed a system that can capture this information. Providing this data to the providers and administrators will improve patient outcomes, patient satisfaction, profit, and employee satisfaction.

The team very enthusiastic and is on track to install the system at UW Medical Center. Questions the fellow can help answer are how scalable is this approach and how does it compare to alternatives, if there are any?

6. 3D-Printed Hydrogels for Fermentation Processes

UW Principal Investigator: Alshkim Nelson
Department: UW Chemistry
UW CoMotion Technology Manager: Ryan Buckmaster

Fermentation is an age old technology using micro-organisms, like yeast and bacteria, to produce beer and wine, food, fuels, pharmaceuticals and many industrial chemicals. However, fermentation has the down side of being a messy process done in batches which limits efficiencies and requires difficult purification methods due to the yeast and bacteria all dying at the end of the process. Our team has developed a technology that immobilizes living cells for fermentation allowing easy continuous production with high efficiency and high quality (see https://www.economist.com/news/science-and-technology/21724797-print-me-brewery-better-way-make-drinks-and-drugs).

We have completed a proof-of-concept demonstration that shows we can 3D print yeast-containing hydrogels that can continuously produce ethanol from glucose. We believe that this approach is broadly applicable toward other cell-types, and is illustrative of a promising technology for the future of bio-based chemical production. Fermentation is used to commercially produce a range of products that include pharmaceutical drugs and proteins (antibiotics, insulin), vitamins, chemical feedstocks, and biofuels. We seek someone who can perform an analysis of these different targets and provide guidance to which market would be impacted the most by our technology.

7. Programmable Therapeutics

UW Principal Investigators: Cole Deforest
Department: UW Chemical Engineering
UW CoMotion Technology Manager: Ryan Buckmaster

Many therapeutics for treating diseases such as cancer or arthritis are tremendously effective if they reach the right location in the body, but can also cause significant unwanted side effects due to interactions in other tissues. Ideally, these drugs would be programmable, such that they could be activated at specific sites, resulting in more effective treatment and minimal side effects. Our group has recently developed an exciting flexible synthetic strategy to make hydrogels that do just that (Nature Chemistry, 2018; PCT Application Filed 2/2018). These materials can be tailored to selectively carry small molecule or cell-based therapeutics to specific sites in the body, increasing overall "good" effects while minimizing harmful effects.

Given the generalizability of the approach, we seek a Summer Fellow to help us focus our efforts by identifying the best near term and long term markets for this technology.

8. Gene Therapy Platform

UW Principal Investigators: Nicholas Whitehead and Stan Froehner
Department: UW Physiology & Biophysics
UW CoMotion Technology Manager: Jennifer McCullar

We have developed a non-viral, antibody-targeted strategy for delivery of large genes to muscle, potentially important in the treatment of diseases like Duchenne muscular dystrophy (DMD). Importantly, using our approach we have preliminary evidence providing proof-of-principle that gene size is not a limiting factor with our novel method. Non-viral methods such as ours are also less likely to elicit an immune response than methods currently in use, which would permit repeat dosing over time. From a commercialization standpoint, our innovation has the potential to overcome important hurdles with current gene therapy approaches, and can be applied to a wide-range of rare and prevalent diseases affecting muscles.

We are in the process of forming a startup company. As such, we are very interested in working with a Summer Fellow to explore the market potential of our new innovation as a treatment approach for both DMD and the broader neuromuscular disease landscape. We would also like the Fellow to formulate a business plan that outlines strategies for obtaining early seed funding to continue pre-clinical research and product development.

9. DNA Bar Coder

UW Principal Investigators: Karl Bohringer
Department: UW Electrical Engineering and Bioengineering
UW CoMotion Technology Manager: Forest Bohrer

Our goal is to create a rapid screening tool that can validate the source species of timber and wildlife products. This device will be used by law enforcement and agents of conservation to ensure that products are not sourced from endangered or protected species or populations. To accomplish this, we are developing a system that can automate a DNA test with a microfabricated chipset and a field-deployable driving unit. Current prototypes are being developed to suit the needs of local officers at the Washington Department of Fish and Wildlife. The next steps are to expand the target species library, improve the reliability and durability of the microfabricated chips, and optimize the driving platform for scaling up manufacturing. Finally, an intensive market research analysis must be performed to determine the commercial potential and best avenues for commercialization for this device.

An MBA/graduate student Summer Fellow would be most helpful in assisting in the evaluation of the DNA Bar Coder/ARC Amplification Chip's potential market and in its value compared to uses in other markets such as clinical medical applications. This will help us determine our next steps for the technology and provide support in licensing negotiations to third parties who may be interested in adopting the technology.

10. Wearable Tissue Paper Sensors

UW Principal Investigators: Jae-Hyun Chung
Department: UW Mechanical Engineering
UW CoMotion Technology Manager: Forest Bohrer

University of Washington engineers have turned tissue paper into a new kind of wearable sensor that can detect a pulse, a blink of an eye and other human movement. The technology, described in a paper published in January in the journal Advanced Materials Technologies and described here https://www.washington.edu/news/2018/02/12/tissue-paper-sensors-show-promise-for-health-care-entertainment-

robotics/ shows that by tearing tissue paper that's loaded with nanocomposites and breaking the paper's fibers, the paper acts as a sensor. In their research, the scientists used conventional paper towels doused with carbon nanotube-laced water. Carbon nanotubes are tiny materials that create electrical conductivity. Each piece of tissue paper has both horizontal and vertical fibers, so when the paper is torn, the direction of the tear informs the sensor of what's happened. The sensor is light, flexible and inexpensive, with potential applications in health care, entertainment and robotics. To trace eye movement, they're attached to a person's reading glasses, while monitoring a person's gait could be achieved by placing the sensors at different points in a special sock.

The team interested in exploring market opportunities in entertainment, AR/VR applications, medical/health, and occupational therapy.

11. Olico Biotherapeutics

UW Principal Investigators: George Ueda, Jorge Fallas, and David Baker
Department: UW Institute for Protein Design, Biochemistry
UW CoMotion Technology Manager: Dennis Hanson

The vision of Olico is to engineer a new generation of custom-designed biotherapeutics to not only improve upon existing medicines, but also to address many untreated modern-day diseases. Over the past several years working in the UW's Institute for Protein Design, we have pioneered a design process for generating functional protein oligomers, a class of biologics that are capable of engaging cells and turning on specified signals to treat diseased states. Our first proof-of-concept molecule turns on the growth signal in red blood cells, and is undergoing continued development as a potential therapeutic alternative for treatment of anemia. In the immediate future, we are applying the same underlying design platform to rationally engineer new molecules that turn on the programmed cell death response in tumor cells, as a unique treatment for several cancers including colorectal, non-small cell lung carcinomas, and non-Hodgkin's lymphoma.

Olico's initial team of two will support the Summer Fellow as the Fellow develops a market analysis. This will help us determine the potential for various indications in these cancer spaces and inform our next steps.

12. Dental Implant Stability Tester

UW Principal Investigators: John Sorenson and Steve Shen
Department: UW Restorative Dentistry and Mechanical Engineering
UW CoMotion Technology Manager: Forest Bohrer

The project is to develop a prototype of a dental implant stability tester. In this prototype, we will use experimental modal analysis and finite element models to estimate an angular stiffness of a dental implant. The procedure has been demonstrated in the lab to be very accurate and can differentiate stability produced by implants of various lengths and diameters. We have filed a provisional patent and started discussions with three dental equipment and implant companies (NSK, Straumann, and Biohorizon) for possible licensing. The current feedback is that this device is certainly needed. A viable business model, however, needs to be worked out and can vary from company to company. We feel that a prototype will advance our position to champion this device and negotiate better terms with potential licensees. The two members of the project have extensive experience in dental implant and equipment industry. Dr. Sorensen has extensive research experience and connection in dental implant industry. Dr. Shen is now a consultant of NSK, a Japanese dental equipment manufacturer and supplier.

An ITHS-WRF fellow would be critical to providing business model support to the licensing program for this device.