

OHSU/OGI Successes -2008

Department of Biomedical Engineering:

The BME department has benefited greatly from the ETIC funding it has received over the past year. With 14 faculty (four of whom are ETIC funded), 25 PhD students, 3 Master's students, and 21 post-docs and research staff, the BME department has grown its research programs significantly in the last year. Active federal and corporate research funding now totals more than \$12M, and BME faculty collaborate with a number of companies with operations in Oregon, including Genentech and Intel, as well as small businesses such as Spry Learning and HemCon. ***To date, three startup companies have been spun off from BME research programs: Revitus, Cylerus and Aronora.***

ETIC funding currently supports faculty members in each of the three core BME research areas at OHSU: Cardiovascular and cellular engineering, Biomedical Optics, and Neuroengineering. Within the area of cardiovascular and cellular engineering, Dr. Owen McCarty's research focuses on unraveling the pathways that regulate pathological clot formation. His recent manuscript characterizing the binding of a novel anticoagulant to blood cells has been hailed in an editorial commentary as "a significant advance in understanding the functions and antithrombotic potential of (thrombin) in particular, and the approach of using engineered human proteins more broadly...". In collaboration with Dr. McCarty, Dr. Andras Gruber has engineered and patented a molecule that could someday save the lives of thousands of stroke and heart attack victims. This work has led to a spin-off company (Aronora).

In the area of biomedical optics, ETIC funding has helped Dr. Donald Duncan lay the groundwork for a sustained research effort in physical and statistical optics as applied to biomedical problems. Dr. Duncan recently received pilot funding from the Medical Research Foundation to study methods of quantifying cell alignment in culture tissues, as well as funding from the NIH for collaborative work with Johns Hopkins and Catholic Universities, developing laser speckle techniques for assessing retinal blood flow.

In the Neuroengineering area, Dr. Tania Vu has expanded her work on designing and applying quantum dot nanoparticle probes as tools for visualizing single receptor molecules inside cells. This work has been published in high impact journals (including 2 publications in Nano Letters, impact 9.96), and over the past year resulted in grant funding from the U.S. Army, Sharp Labs of America, OCTRI, and ONAMI of more than \$1.42M.

Computer Science & Electrical Engineering

New faculty hires – Computer Science & Electrical Engineering

Kemal Sönmez: *Assistant professor*

Kemal Sönmez received his Ph.D. in electrical engineering from the University of Maryland in 1998. He also holds an M.S. in electrical and computer engineering from North Carolina State University. Most recently, Sönmez was a senior research engineer at the Speech Technology and Research Laboratory in the Information and Computing Sciences Division of

SRI International. SRI International, formerly Stanford Research Institute, is an independent, nonprofit research institute that conducts research and development for government agencies, commercial businesses, foundations, and other organizations. Their Speech Technology and Research Laboratory is internationally recognized in the field of speech technology development. Sönmez' expertise is in discovering and implementing algorithms that lead to a better understanding of biological processes; one recent application of his work was in sequence-to-function analysis of genes and proteins. Sönmez's School of Science & Engineering research is ETIC funded.

OGI's Center for Spoken Language Understanding (CSLU) has become a world-renowned academic research center focusing on speech and language technologies, including speech recognition, computer-generated speech, and voice transformation. Since 2000, when Jan van Santen became CSLU director, he, Dr. Hosom, and Dr. Roark have parlayed the ETIC investment into more than \$11M of federal and business funding.

Annually, Drs. van Santen, Hosom, and Roark have provided employment to 10 to 15 postdoctoral fellows, programmers, and graduate and undergraduate student assistants. The ETIC investment has enabled CSLU to add a new branch to its activities: Creating new speech and language technologies for neurologically based disorders such as Parkinson's Disease and autism. For example, CSLU received a \$2.9M grant from the NIH for new technologies for diagnosis of autism. This establishes CSLU as the leader in this new and exciting area and capitalizes on OHSU's strengths in these disorders.

The Center's research could lead to a new Oregon industry that provides low-cost solutions that allow caregivers and teachers to better help individuals with neurological disorders. An example is BioSpeech, which creates products from intellectual property generated by CSLU and has already received \$350K in federal funding.

School of Science & Engineering Student Profiles:

Kristy Hollingshead
Ph.D. Candidate
Computer Science & Engineering
Center for Spoken Language Understanding



Kristy originally came to OHSU's School of Science & Engineering from her hometown of Denver. Kristy's undergraduate degree was in English-Creative Writing, with a minor in Computer Science. At heart Kristy was interested in careers that were more technical than what was available to her with a liberal arts bachelors degree, so she decided to pursue a master's in computer science with an emphasis on Spoken Language Systems. After about 8 months in that program, she applied for and was accepted into the Computer Science PhD program. Her research focus has been Natural Language Processing, particularly the area of parsing. Kristy builds computer programs to automatically analyze the grammatical structure of sentences in natural

language, such as **news articles and blogs**. The grammatical structure of a sentence provides some information about the inherent meaning in the text, such as who was the subject of the sentence and what was the action performed by the subject. Kristy's research has potential applications in several different fields, from gene sequence labeling for a biomedical application, to improved language models for speech recognition, to phrase alignment for machine translation, to improving the efficiency of clinical diagnoses. Kristy has worked on a few projects for providing aid in the diagnosis of disorders such as **Alzheimer's and Autism**. For example, by analyzing the difference in the syntactic structure of speech samples elicited from two different subject groups, Kristy's research group were able to automatically differentiate between normal subject groups and subjects with Mild Cognitive Impairment. Thus, Kristy's **ETIC Funded research** has provided some support to other projects in the Center for Spoken Language Understanding to meet their goal of building a bridge between speech and language technologies and communication disorders and other related disorders.

Kristy plans to "**work either in a research lab or in an industry lab such as those at Google, Microsoft, or IBM.**" Long term, Kristy shows interest in an academic position at a teaching-focused university. Originally from Denver, CO. Kristy has grown to love the city of Portland. "The people are very friendly, and the public transportation system is excellent! I've enjoyed many extra-curricular activities here (which I try to fit in as best I can between all of my responsibilities at school!), including skiing on Mt Hood, going to see live shows by new music groups, trying out new restaurants downtown, and hiking or trail-running in Forest Park."

Michelle Berny
Ph.D. Candidate
Biomedical Engineering
Cardiovascular Engineering track.

Michelle Berny is from Astoria, Oregon. Michelle is a Whitaker International and ARCS scholar.

"The strong reputation of OHSU's medical school and research initially led me to apply to the School of Science Engineering. Dr. Owen McCarty's (**ETIC Funded BME Professor**) cardiovascular research, incorporating engineering and cellular biology with medicine, was a solid fit for my background in bioengineering and matched my research goals." Dr. McCarty has been Michelle's research mentor and faculty advisor since she came to the School of Science & Engineering. In addition, to working in Owen's Lab, Michelle found that the strong ties between the School of Science & Engineering and other OHSU research programs allowed for the possibility of successful collaborations."



The laboratory Michelle joined at OHSU focuses on the crossover between cellular biology and engineering, specifically to analyze the role of blood platelets in the cardiovascular system. Initial projects have focused on interplay between platelets and coagulation. The first project was inspired by a finding of Dr. Andras Gruber (OHSU BME)

that the mutant thrombin, WE, acts as an antithrombotic agent in vivo without affecting hemostasis. Through studies of the interactions of platelets and WE, we characterized the molecular mechanisms of WE binding to platelets, providing an explanation for the antithrombotic effects. Further projects have centered upon the interactions of platelets with the coagulation factor XI and the role of platelet heterogeneity in coagulation. An author on four peer-reviewed papers to date Michelle's research focuses primarily on Biomedical Engineering issues related to clotting mechanisms, stroke, and heart attack.,

Upon completion of her graduate degree, Michelle plans to pursue a postdoctoral position continuing cardiovascular research. Michele's future career goals are to earn a research position in a medical setting, again with a cardiovascular focus. Michele plans to leave the state for her postdoctoral position but intends to return to Oregon to further her career.