2015 Incubating Interdisciplinary Initiatives (I 3) Award Recipients

The Incubating Interdisciplinary Initiatives (I 3) award program fosters new interdisciplinary research projects at UO. The Office of the Vice President for Research & Innovation (OVPRI) is pleased to announce the following recipients for 2015:

Dare Baldwin, Psychology and Terry Takahashi, Biology
"A Novel Tool for Perceptual and Cognitive Assessment"

We acquire a vast array of mental skills in the first two years of life. We learn to produce and understand speech and to recognize important events in our environment and their consequences. Problems during this period can have life-long consequences so it is crucial to diagnose problems early, but because infants and toddlers cannot talk or follow instructions reliably, behavioral tests that are simple to administer to older children will not work. We therefore propose to develop a method for measuring behavioral performance in children 0-2yrs that requires no voluntary response; only a video-recording of the pupils. The pupils widen when an attention-getting event occurs. Therefore, by monitoring the pupils, we can tell whether or not a young child detected a faint sound or an interesting event in a video. Our goal is to develop the hardware and software for monitoring pupillary size in infants and toddlers. The I3 Award will allow us to develop this device in a focused, sustained manner. To test the device, Professor Dare Baldwin (Psychology) will apply the device to her lab’s study of attention in children, and Professor Terry Takahashi (Biology) will use the device to assess their hearing. The project will generate the pilot data and proof-of-principle needed for successful grant applications to the National Science Foundation and the National Institutes of Health, as well as developing a novel tool for the lab and clinic.

Marina Guenza, Chemistry and Biochemistry and Allen Malony, Computer and Information Science
"A Virtual Laboratory in ‘In Silico’ Discovery of Polymeric Materials (Project POLIS)"

Future design of advanced materials will not rely on traditional "wet lab"
approaches. With advances in high-performance computing and computational chemistry, the materials design field is on the verge of a fundamental culture shift away from methods that are tedious, costly, and harmful to the environment. The Materials Genome Initiative (MGI) is a national call to research action to accelerate the state-of-the-art in materials modeling. The POLIS project brings together an interdisciplinary group of UO scientists and external international partners to create a virtual laboratory for the design and testing of novel polymeric materials "in silico" with sophisticated control of the experimental conditions. The project integrates the unique expertise of UO scientists in modeling of polymeric materials and advanced computational methods with the expertise of the external collaborators, and proposes to integrate these methods into leading molecular dynamics simulations packages. In the first six months, the POLIS project will work aggressively to demonstrate prior results for a grant submission to the NSF MGI program Designing Materials to Revolutionize and Engineer our Future (DMREF), due in January 2016. POLIS will then create a virtual laboratory prototype, consisting of a polymeric material design database and simulation analysis services, in preparation for a second grant submission to NSF Office of Cyber Infrastructure program Computational and Data-Enabled Science and Engineering (CDS&E), due in October 2016. Given our Department of Energy (DOE) external partners, the POLIS team will also be well-positioned to respond to grant opportunities through the DOE, Basic Energy Sciences (BES) program.

**Ihab Elzeyadi**, Architecture and **Paul Dassonville**, Psychology / ION

"**Bridging Architecture and Neuroscience: Quantifying Impacts of Spatial Daylight Type and Quality on Task Performance, Stress, and Stress-recovery - An Experimental Investigation**"

Daylighting in buildings has been positively associated with better performance and reduced stress, leading to improved occupant satisfaction and well-being. Members of our team (Elzeyadi, 2012) have shown a positive correlation between daylighting and views of nature on employees’ reduced sick-leave and office related sick-building-syndrome (SBS) symptoms in a previous quasi experiment. Studies from neuroscience suggest that these types of effects may be attributed to the relationships between photoreceptive retinal ganglion cells and brain structures involved in circadian modulations and cognitive/perceptual processing. However, despite a growing interest in the topic by both researchers and practitioners, there is a lack of evidence related to the specific spatial and environmental attributes of daylight (e.g., dosage, intensity, quality, and duration) that are associated with positive impacts on human performance and health. Advances in Light Emitting Diode (LED) electric light sources and display screens with full-spectrum wavelength have made possible environments with simulated daylighting, but it remains uncertain whether these simulated environments provide the same positive human responses associated with actual daylight. Such knowledge gaps lead to speculations that can influence the building design industry to apply concepts that are not fully researched, or even lead to design decisions with serious
negative outcomes. This pilot study attempts to quantify the impacts of dosage, duration, and quality of daylighting/views of nature from windows, simulated views and lighting using LED screens, and LED luminaires that claim the full-spectrum radiation of spatial daylighting. The study will employ experimental run-rooms to quantify the impacts of the independent variables on participants’ stress level, alertness, and stress-recovery, and will use fMRI technology to assess neural modulations in brain systems involved in attention, mood, and stress.