# On-going projects

## A Wireless Sensor Microsystem for Monitoring the Effects of Micro-Neutrients on Aging

Oregon State University
School of Electrical Engineering and Computer Science
Prof. Gabor C. Temes, Prof. Patrick Y. Chiang,
Prof. Tory M. Hagen, and Prof. Gert Cauwenberghs (University of California San Diego)
Students: Mr. Xin Meng, and Mr. Eric Smith

## Self-Aware Computing for Cyber Physical Systems

Columbia University
School of Engineering and Applied Science
Prof. Mingoo Seok, and Prof. Peter Kinget
Students: Mr. Seongjong Kim, and Mr. Teng Yang

## *2015 Call for Proposals*

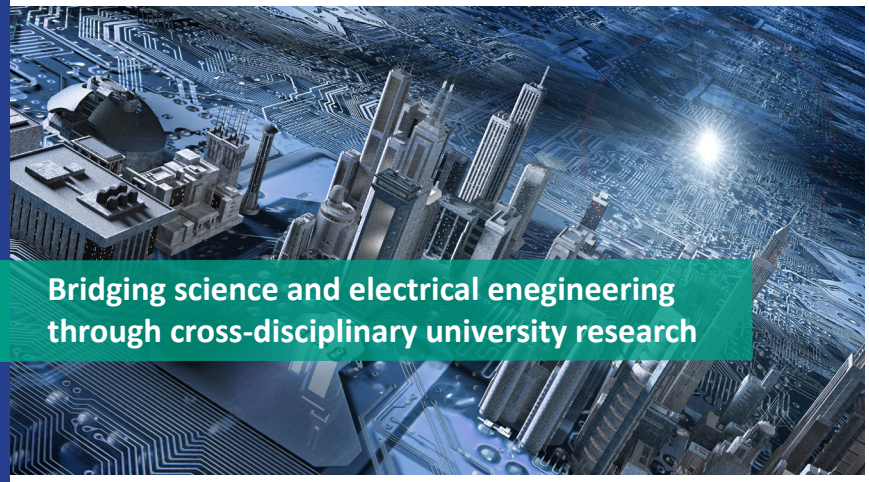
The Foundation invites proposals for one-year supplemental funding ($20,000). The project must focus on cross-disciplinary research involving analog or mixed analog-digital Integrated Circuits.
Deadline: December 1, 2014
For more information, please visit
http://www.catalyst-foundation.org

Catalyst Foundation

# Catalyst Foundation

Since 1992

*2014 Newsletter*

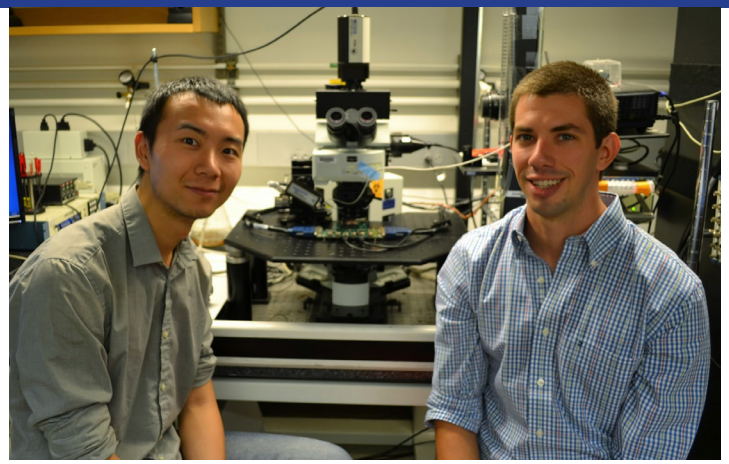



## Congraturations,
## Harvard University and Purdue University !!

11 reviewers examined 28 applications and
2 projects have been chosen for
2014 Multi-Year award.

In 2013, we solicited proposals for full funding. Due to the recent effort to let the research community know about the Foundation's mission and funding activities, we received 28 outstanding proposals. The Foundation asked 11 external experts to review approximately 10 proposals each. Although we planned to accept only one full-funding proposal for this year, we decided to fund two projects since the quality of the proposals was excellent. Please review the brief description of new projects in this newsletter. In addition to the on-going projects at Oregon State University and Columbia University, we are now funding 4 full-funding projects. We look forward to having excellent progress on the projects!

# 2014 multi-year award winners



Mr. Abbott (right) and Mr. Yale Ye (collaborating PhD student from Prof. Hongkun Park's group)

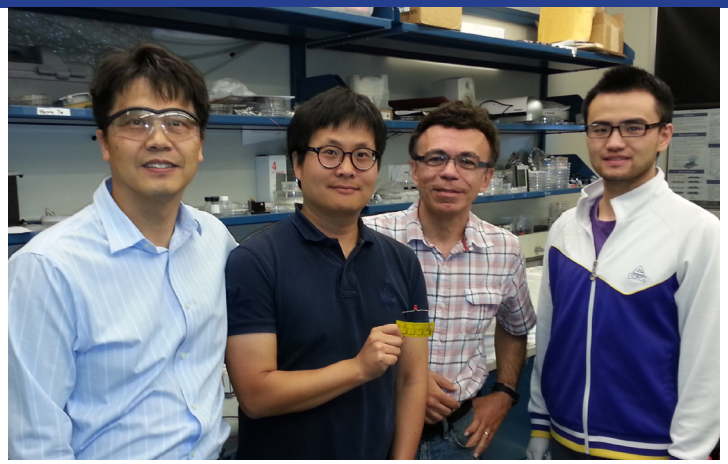
## CMOS-Assisted Nano-Bio Array for Neurotechnology


Harvard University
Principle Investigators:
Donhee Ham (Electrical Engineering & Applied Physics),
Hongkun Park (Chemistry & Chemical Biology & Physics)
Student: Jeffrey T. Abbott (PhD Student, Electrical Engineering)



***Abstract***

The patch clamp technique can perform intracellular recording of neurons, but is not well suited for parallel recording; an array of microelectrodes can do parallel recording, but they are too large to access the interior of live neurons. In fact, no methods currently available are capable of both intracellular and parallel recording of mammalian neurons, while such dual ability can offer new possibilities in neurotechnology as well as fundamental neuroscience. Nano-bio interface may be one way to tackle this issue, as recently shown by co-PI, Park [Nature Nano. 7, 180 (2012)]: nanoelectrodes can penetrate into live neurons, acquiring intracellular access; an array of these nanoelectrodes—whose construction is possible via standard top-down fabrication—can then enable intracellular and parallel recording. Here we will develop a CMOS integrated circuit with an array of nanoelectrodes on top. The CMOS electronics (an array of analog amplifiers and digital control electronics) right below the nano-bio interface array will facilitate parallel operation of nanoelectrodes, and increase the recording sensitivity. The high impedance of nanoelectrodes and low-frequency sub-threshold neuronal signals pose a unique challenge for the semiconductor circuit design. Subsequently, we will use this unprecedented electrophysiological tool for pharmaceutical screening for neurological disorders and cellular-level neuroprosthesis.

Left: Prof. Jung, Mr. Seo, Prof. Ziaie, and Mr. Wuyang Yu (graduate research assistant in Prof. Ziaie's group)

## Urine-Powered Wireless Urinary Tract Infection Monitoring Sensor For Smart Diaper Platform


Purdue University
Principle Investigators:
Byunghoo Jung (School of Electrical & Computer Engineering),
Babak Ziaie (Weldon School of Biomedical Engineering)
Student: Weeseong Seo (PhD Student, Electrical & Computer Engineering)



***Abstract***

Urinary tract infection (UTI) is the second most common infection in the body accounting for more than 7 million office visits and 100,000 hospitalizations per year. UTI can be a major source of morbidity and mortality in geriatric patients in particular those suffering from neurodegenerative diseases. Also UTI causes 51 per 100,000 children to be hospitalized annually and 174 per 100,000 infants to be hospitalized annually. Many of the disabled elderly, young children, and infants are not capable of understanding symptoms of a UTI, and many that are capable have difficulty communicating this to caregivers. Early identification and treatment of UTIs is vital to prevent major sequelae or death. The goal of the project is to develop a wearable self-powered wireless sensor for autonomously screen for UTI, and improve the quality of life of elderly, young children, infants, and those suffering from neurodegenerative diseases.