Japan funds new international energy center, led by University of Illinois

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A new materials research institute focused on overcoming the challenges to achieving a carbon neutral society is the latest of six World Premier International Research Centers (WPIs) to be funded by Japan's Ministry of Education, Sports, Culture, Science and Technology. Through this program, Japan aims to establish preeminent research centers that leverage the resources of the international community to overcome barriers and make breakthroughs in clean energy science.

The International Institute for Carbon-Neutral Energy Research (I²CNER) is located at Kyushu University in Japan, with a satellite location at the University of Illinois at Urbana-Champaign (UIUC). I²CNER will be funded entirely by the government of Japan, at a level of about $16 million per year for five years, with the possibility of extensions. The Institute will be led by Petros Sofronis from the University of Illinois.

I²CNER is the only WPI directed by a non-Japanese researcher, although more than 30% of the researchers at each WPI are from overseas. Japan is investing in international research centers in part because of its geographic location, said Yoshinori Yamamoto, who directs the Advanced Institute for Materials Research at Tohoku University. Researchers can easily travel between North America and Europe exchanging ideas and collaborating, he said, but Japan is more isolated. Establishing these centers is a way to foster an international research environment within Japan.

The partnership between Kyushu University and the University of Illinois has its roots in a previous research collaboration related to mechanical properties of materials in the presence of hydrogen. From this evolved the idea for an institute focused on the fundamental research underlying the technological developments necessary for a hydrogen-powered society, said Sofronis. "Certainly, this is an ambitious plan that we feel provides the international community with a new vehicle for conducting research and pursuing solutions to the energy problems that are global."

Director Petros Sofronis (first row, third from right) stands with fellow researchers at a kickoff symposium for I²CNER at Kyushu University on February 1, 2011.

In addition to advancing research through staff and student exchanges, joint faculty appointments, and other collaborative activities, a secondary goal of I²CNER is to expose the Japanese university system to the structure and management style of U.S. research universities. "I²CNER seeks to incorporate work experience obtained at a world-class research university [UIUC] into the operation of not only the Institute, but also of Kyushu University," said I²CNER President Setsuo Arikawa in a welcome message posted on the center's website. "This approach to management also characterizes a paradigm shift for research, operation, and administration at Japanese universities."

One of the main differences between university research in the two countries is the laboratory culture. Research in U.S. universities is largely driven by graduate students and postdoctoral researchers who work with collaborating junior and senior faculty members. Research laboratories in Japan traditionally have a more hierarchical structure, where students, postdoctorates, and junior members have less influence on research directions. Kyushu University is interested in exploring this and other differences, which are among the reasons that the University of Illinois was chosen to lead the institute.

Within I²CNER, research groups are categorized by theme: hydrogen production, hydrogen structural materials, fuel

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cells, thermophysical properties, hydrogen storage materials, materials transformations, CO_2 separation and concentration, and CO_2 sequestration and storage. These priorities are closely aligned with the U.S. Department of Energy's Hydrogen and Fuel Cell Technology Program, which funded much of Sofronis's prior research. In addition, these areas of focus reflect those highlighted as potential areas of collaboration between the United States and Japan in a November 2009 meeting between United States President Barack Obama and then Japanese Prime Minister Hatoyama Yukio.

The Institute will eventually involve more than 200 researchers and staff, with more than 25 principle investigators divided among the eight research themes. The researchers span multiple disciplines, including physics, chemistry, materials science and engineering, geosciences, and ocean science.

Several other institutions are collaborating on the project, including the University of Tokyo and the National Institute of Advanced Industrial Science and Technology in Japan, the Dalian Institute of Chemical Physics and Tsinghua University in China, Imperial College London in the United Kingdom, the Swiss Federal Institute of Technology, and the University of California–Berkeley, Massachusetts Institute of Technology, and Sandia National Laboratories in the United States.

"As we all know, fundamental scientific research to understand complex and interrelated phenomena requires support characterized by longevity. It is precisely this type of an environment for the international research community that I²CNER strives to create with the generous support from the government of Japan," said Sofronis.

The WPI program is run by the Japan Society for the Promotion of Science, a government agency that supports programs to advance science research in Japan. The program was created in 2007 to fund research, establish international research environments in Japan, reform research organizations, and create new domains of interdisciplinary research.

The other WPIs include the Advanced Institute for Materials Research (Tohoku University), the Institute for the Physics and Mathematics of the Universe (University of Tokyo), the Institute for Integrated Cell-Material Sciences (Kyoto University), Osaka University Immunology Frontier Research Center (Osaka University), and the International Center for Materials Nanoarchitectonics (National Institute for Materials Science).

For more information on the World Premier Institutes, visit www.jsps.go.jp/english/e-toplevel. Additional information on I²CNER can be found at http://i2cner.kyushu-u.ac.jp/en.

Kendra Redmond

U.S. releases reports on STEM jobs

www.esa.doc.gov/reports/women-stem-gender-gap-innovation
www.esa.doc.gov/reports/stem-good-jobs-now-and-future

The U.S. Department of Commerce's Economics and Statistics Administration (ESA) released two reports that profile U.S. employment in the science, technology, engineering, and mathematics (STEM) fields. "STEM: Good Jobs Now and for the Future" reports U.S. growth in STEM jobs overall while "Women in STEM: A Gender Gap to Innovation" finds, as expected, that there are fewer women than men in STEM jobs and attaining degrees in STEM fields as well as a wage disparity based on gender.

Over the past 10 years, growth in STEM jobs was three times greater than that of non-STEM positions. STEM employment is expected to continue to grow at a faster rate than other jobs in the coming decade (see Figure 1). Meanwhile, STEM workers are also less likely to experience joblessness.

Further findings show STEM employees command higher wages, earning 26% more than their non-STEM counterparts. STEM degree holders also enjoy higher earnings, regardless of whether they work in STEM or non-STEM occupations. Likewise, college graduates—no matter what their major—enjoy an earnings premium for having a STEM position.

Through initiatives such as Race to the Top and the "Educate to Innovate" campaign, President Obama has made STEM education a key priority and has laid out an ambitious goal to move U.S. students from the middle of the pack to the top of the pack internationally in science and math achievement over the next decade.

While women make up 48% of the U.S. workforce, only 24% hold STEM jobs. Over the past decade, this underrepresentation has remained fairly constant, even as women's share of the college-educated workforce has increased.

Women with STEM positions, how-

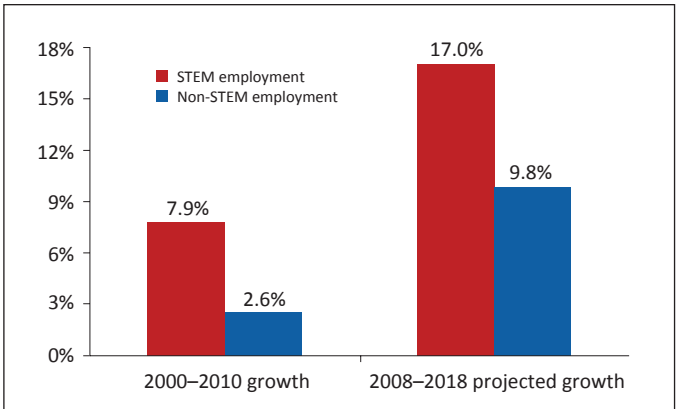

Figure 1. Recent and projected growth in science, technology, engineering, and mathematics (STEM) and non-STEM employment. *Source*: Economics and Statistics Administration calculations using Current Population Survey public-use microdata and estimates from the Employment Projections Program of the Bureau of Labor Statistics; ESA Issue Brief #03-11 (July 2011).

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