

# Program Update

December 2010

(For the period July-December, 2010)

## STARS (Innovation Research Team) program supporting 3 research teams

1. The **Nanophotonics Team** is being led by Dr. Michael Hochberg at the UW's College of Engineering.
2. The **Biofuels Research Team** is being led by Dr. Birgitte Ahring at the WSU/PNNL Bioproducts Sciences and Engineering Laboratory (BESL) at WSU Tri-Cities.
3. A new **Smart Grid Team** at the UW's College of Engineering is being led by Dr. Hugh Hillhouse and Dr. Daniel Kirschen.

In addition, WSU is recruiting a new STARS researcher to work in the "smart grid" energy area.

### Major STARS Researcher Outcomes this Quarter

#### University of Washington

- Dr. Hochberg's research team secured nearly \$2.7 million in new research funding:
  - More than \$2.4M from the Air Force Office of Sponsored Research to build a set of design rules for the manufacture of optical electronic devices using a foundry.
  - \$250,000 from Intel.
- The eBeam laboratory system is undergoing initial wafer testing. Functional grating couplers and waveguides have been produced.
- Six papers have been published:
  - 11/24/2010: Applied Physics Letters - [Silicon waveguides and ring resonators at 5.5 μm](#).
  - 11/16/2010: Optics Express - [Low-loss strip-loaded slot waveguides in Silicon-on-Insulator](#).
  - 9/11/2010: The IEEE Journal of Quantum Electronics - [Theoretical Study of Optical Rectification at Radio Frequencies in a Slot Waveguide](#).
  - 7/31/2010: Nature Photonics - [Towards Fabless Silicon Photonics](#).
  - 7/28/2010: Optics Express - [Design of transmission line driven slot waveguide Mach-Zehnder interferometers and application to analog optical links](#).

- 7/8/2010: Optics Express - [Demonstration of a low V<sub>π</sub>L modulator with GHz bandwidth based on electro-optic polymer-clad silicon slot waveguides](#).

- Dr. Hochberg's team is currently recruiting for a commercialization post doctoral fellow – a position jointly funded with the Center for Commercialization.
- Two students presented papers at the Group IV Photonics Conference in Beijing China in August/September 2010 .

#### Washington State University

- Dr. Ahring's Bioproducts, Sciences and Engineering laboratory (BSEL) team and the Port of Benton recently was awarded \$951,000 from the U.S. Department of Energy to develop biofuels from non-alcohol fermentation products. A team led by WSU and includes PNNL and several private sector firms will undertake the project.
- The BSEL team and PNNL scientists were awarded funding of over \$1 million per year for two years to perform research in isoprene synthesis.
- Dr. Ahring's team was awarded a PNNL Laboratory Directed Research Development (LDRD) grant titled "An understanding of the role of functional redundancy within a microbial community.
- The research team has about \$4.9 million in research proposals submitted and pending review with various federal and state agencies.



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### Major Entrepreneurs-in-Residence (EIR) Outcomes this Period

#### University of Washington

**Three new EIRs join the team**

**Three new start-up companies launched**

#### Personnel

**Continuing EIRs include:**

- Dave Croniser, medical devices
- Tom Schulte, point-of-care diagnostics
- Ken Myer, wireless and IT
- David Kaplan, smart grid
- Stephanie Amoss, market strategy and analysis across all sectors

**Three new EIRs have joined the team:**

**Henry Berg** focuses on the application of new technologies to business problems. His experience ranges from hands-on product development to business strategy and management. Henry is a director with A3 Alliance, LLC, which makes convertible debt investments in start-up and early-stage technology companies. Prior to A3, Henry held several roles at Microsoft, where he developed a big-picture view of the challenges facing technology companies today.

Before joining Microsoft, Henry was a Managing Principal Engineer, Hardware, for Vulcan Inc., leading a group charged with developing a motherboard for Vulcan's FlipStart handheld PC. He earned a BS in electrical engineering and digital systems from Yale University, and an MS in computer science from Stanford University.

**Neil Fanger**, a Seattle-based scientist and entrepreneur, will focus on therapeutic and diagnostic opportunities. He has more than 15 years experience in the life sciences industry, spanning business development, product strategy, and biological research. In 2002, Fanger co-founded

Teranode Corporation, a leading provider of software solutions to the life sciences industry.

As Chief Business Officer, he led teams that introduced new products in the marketplace and secured multi-year worldwide license and services agreements with strategic customers. He earned a PhD in physiology from Dartmouth Medical School, and a BS in chemistry from Denison University.

**Terri Butler** has joined us as a "targeted EIR" to work short-term on a specific opportunity: working with Professor Alex Jen, Chair of the Department of Materials Science & Engineering, on a startup called Soluxra that leverages high-performance organic/hybrid functional materials and polymers for a wide variety of electro-optic applications. He brings more than 20 years experience in technology and market development to her role as an Entrepreneur-in-Residence for materials-based start-ups.

Having worked in both large and small companies, as well as in academia, Terri is uniquely positioned to bridge the gap between university technologies and commercial application. Her strengths are taking leading-edge concepts through the process of market definition and product development, and then introducing them to early-stage customers.

Terri holds a BS in Biology from Stanford University and a PhD in Chemical Engineering and Materials Science from the University of Minnesota. Terri has also helped Dr. Pat Stayton's smart polymer technology (Department of Bioengineering) obtain support from the Coulter Foundation to investigate applications in clinical diagnostics.

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### **EIR Highlights**

Three UW start-up companies were launched recently:

- **Cardiac Insight** is a medical device company based on Dr. David Linker's algorithms.
- **CorazonX** is a re-start around an ultrasound technology for detecting coronary artery disease.
- **Lamprogen** is a UW start-up that develops products and technologies to address the needs of biomedical research.

**Tom Schulte** has been working closely with several existing and potential spin-out opportunities.

- Tom is working with Nanofuture, which uses UW technology for DNA isolation (Jae-Hyun Chung, Department of Mechanical Engineering), to prepare their pitch for the spring Innovation Showcase of the Technology Alliance.
- Tom has also helped Dr. Pat Stayton's smart polymer technology (Department of Bioengineering) obtain support from the Coulter Foundation to investigate applications in clinical diagnostics.
- Tom and Jennifer McCullar, a C4C technology manager, arranged a presentation by Dr. Jens Gundlach of his nanopore sequencing technology (Department of Physics) at the Institute for Systems Biology to explore commercial applications.

**Terri Butler** has focused on two early stage materials technology start-up ventures, Soluxra and Envitrum.

- **Soluxra** plans to bring photonic and electronic organic materials to market. These materials will be key components in high-speed telecommunications, optical computing, and clean energy devices.
- **Envitrum** is in the innovative "green" building materials market. The company's first product, Vitrobrick," is made entirely from recycled glass. The patent-pending micro-porous material is stronger than standard brick and much lighter in weight. Terri has helped the two company founders, Renuka Prabhaker and Grant Marchelli, hone their message, making it clear and compelling for the investment community.

**Ken Myer** has been working with researchers and UW staff who have created innovative software and hardware technologies that show real promise of being turned into a successful commercial businesses. Examples of potentially game-changing technologies include:

- Low power wireless technology called "Bumblebee" that brings unparalleled battery life to small body-worn sensors.
- "SNUPI" technology that transforms the wiring of a home into an antenna that can be used to monitor a variety of activities.

Ken also has been helping University staff build a business around innovative software they have created to solve challenges they face in the course of their work. The solutions he has worked on have made a significant impact to the day-to-day work of staff at the UW and have garnered significant interest from businesses around the country.

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### **WSU: Three industry veterans working under WSU's EIR program**

#### **Kevin Petersen's Project:**

*Dr. Juming Tang's microwave sterilization technology*

The newly formed company, Food Chain Safety, L.L.C. (FCS) is now the exclusive licensee of WSU's patent for microwave sterilization. As the licensee, FCS will be manufacturing microwave sterilization food processing systems for the food industry. Members of the consortium formed in November will be the first customers of FCS.

Three orders for \$5million already have been submitted. The consortium is also providing guidance, through final design changes, and developing strategies for FDA approval, marketing, and developing national and international partnerships.

Kevin Petersen travelled to China as part of a WSU and UW delegation to express intent to form partnerships in China. Chinese officials and major food manufacturers expressed a strong desire that WSU and FCS bring this technology to China. Kevin has also identified strategic partners in the European and Indian markets. Development of the business strategy for deploying microwave sterilization in Europe and the remaining industrialized world is in progress.

Serving WSU's mission to bring jobs into WA, WSURF is currently helping FCS negotiate a contract for manufacturing the commercial microwave systems with Key Technologies, a leading manufacturer of industrial food processing equipment based in Walla Walla.

In addition, FCS is currently evaluating several potential locations to open its base of operations

in Washington. Once constructed, the site of FCS' worldwide headquarters will be home to a Microwave Sterilization pilot plant, FDA-approved food certification labs, teaching centers for new Microwave Sterilization equipment operators/technicians and technology support services.

#### **Jerry Schwartz' Project:**

*Intelligent environments*

Jerry is focusing on creating commercial opportunities to leverage the interdisciplinary research of Dr. Diane Cook, Huie-Rogers Chair Professor in the School of Electrical Engineering and Computer Science, and Professor of Psychology Dr. Maureen Schmitter-Edgecombe, as part of the CASAS "smart home" project at WSU.

Combining neuropsychology with applied technology the CASAS project seeks to create Smart Home assistive technologies applied to an in-home setting—offering new techniques and new hope for aging independently in place.

Jerry and the research team have been engaged in active discussions with two of the region's premier assisted living companies to finalize opportunities for "live environment" trials of the technology package and neuropsychology behavioral profiling within targeted assisted care facilities.

Successful operation in an active care environment is projected to be a key enabler to current efforts to fund and form a company to market and license this cutting edge technology platform.

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### **WSU's EIR program**

#### **Lewis Rumpler's Project:**

##### *Revitalizing the c-MET technology*

This technology is licensed to Pacific Northwest Biotechnology, LLC, which is inactive, and the investors have not been actively involved in developing the IP. The inventors, Drs. Harding and Wright, have developed new IP around the c-MET inhibitor technology. Lewis has persuaded investors to return the IP and has negotiated an equitable agreement with them for their earlier investment. Investors are reviewing the drafted agreements to memorialize this understanding.

#### **Peter Quinn's Project:**

##### *Developing sustainable businesses in rural Jefferson County*

Focusing on WSU's portfolio of near-market, modestly scaled economic opportunities, Peter is

- exploring working with a company that re-manufactures medical equipment to produce veterinary surgical tools;
- taking steps to do a proof of concept on the Cheese-to-Bread concept; and
- developing contacts to grow the beer, wine and cider industries in rural Washington using local infrastructure and technical expertise.

#### **Karen Fleckner:**

##### *Collaborative resourcing*

Nu Element, Inc. (NEI) is a system integrator for renewable micro-grid solutions utilizing Distributed Energy Resources (DER) including: waste-to-energy systems, fuel cells, and other types of power generation. Other core

competencies include; fuel processing and desulphurization, waste-to-energy systems.

In partnership with WSU, Nu Element is developing a parallel technology deployment model to facilitate the rapid commercialization of WSU research products. The long-term vision is to combine Nu Elements application driven approach and market connectivity with WSU's research infrastructure and expertise to yield validated, market relevant research products.

WSU, NEI and its teaming partners, The Boeing Company, Topsøe Fuel Cells, and other key fuel cell companies are working to design, build and install a turnkey solid oxide fuel cell battery-extender auxiliary power unit (BE-APU) that operates on bio-aviation fuels to provide power for grounds support equipment and back-up power for critical systems.

This BE-AP is scoped to be demonstrated in Boeing's Eco-demonstrator as a possible in-flight option for further efficiency improvements. Here, the technical innovation is the BE-APU pre-commercial product that is differentiated by WSU's novel catalyst and Nu Element's patented regenerable desulphurizing fuel processing platform that will enable longer system lifetime, more efficient operation, and reduced maintenance.

This unique teaming of university research with system integrators and market leaders aims to shorten the traditional technology deployment timeline by facilitating a parallel approach to product development.



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## WSU's EIR program (continued)

### Bryan Zetlen

In his efforts to develop the Nuclear Research Center commercialization of medical & industrial radioisotope production capacity of the WSU reactor, Bryan has been focusing on establishing broader and deeper ties with PNNL; aligning research priorities and funding opportunities for

WSU Tri Cities and BSEL; and exploring commercial applications and investments in cutting-edge WSU positron research.

### Chris Leyerle & Jeffry Canin

Two of our newest EIR's are meeting with inventors to identify potential technologies.

## STARS Researcher Recruitment Update

### Washington State University

The search committee for the senior (full professor) position is composed of representatives from Schweitzer Engineering Laboratories, Avista Corporation, AREVA T&D Inc., three senior faculty from the College of Engineering and Architecture, and the Vice President of Research.

As of December 1, six candidates from academia and industry across the nation that have been invited to on-campus interviews that will begin in December through early January with an anticipated start date in spring 2011.

The search to fill the mid-level (associate professor) position will continue during the 2010-11 academic year. WSU anticipates filling both positions no later than fall 2011 with candidates that have demonstrated a significant record of attracting external funds, excellent scholarly activity record and creating commercialized opportunities.

### University of Washington

**Hugh W. Hillhouse**, Rehenberg Chair Professor in the Chemical Engineering department and the Molecular Engineering and Science Institute, joined the UW faculty in September 2010. Hugh's

research interests lie at the nexus of nano-materials and solar energy conversion, and he was an important recruit for the growing UW effort in molecular engineering. He has been involved with two start-up companies that have emerged based on technology from his research.

Hugh earned his bachelor's degree from Clemson University, his MS from the University of Washington, and his doctorate from the University of Massachusetts, all in Chemical Engineering. In 2008-09 Hugh spent a sabbatical at the National Renewable Energy Laboratory in Golden Colorado working on quantum dot solar cells where he now has an on-going adjunct appointment.

Previously, he was a University Faculty Scholar and Associate Professor in the School of Chemical Engineering at Purdue University and a Research Associate with the National Renewable Energy Laboratory. At Purdue, Hugh established an NSF-funded facility for In-Situ Small-Angle X-ray Scattering from Nanomaterials and Catalysts, won the Purdue Early Career Research Award, the Shreve Award for excellence in undergraduate teaching, the NSF CAREER Award, and was selected for the National Academy of Engineering's Frontiers of Engineering Program.

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## STARS Researcher Recruitment Update

### University of Washington

#### Hugh W. Hillhouse (continued)

At the UW, Hugh is continuing his research and technology development efforts on developing low-cost solar cells from nanocrystal inks and high efficiency solar cells based on quantum wire arrays. He will be joining other cleantech researchers at UW and moving into the Molecular Engineering building when construction is completed (slated for January 2012). In the meantime, Hillhouse is working with other UW faculty to purchase and set up state-of-the-art solar energy research instrumentation.

**Daniel Kirschen**, Professor, Close Endowed Chair, Electrical Engineering, will start early 2011. His areas of expertise are smart grid, innovative energy management methods for efficient use, algorithms, and alternative clean energy sources (hydro, wind, solar).

Daniel received his Electrical and Mechanical Engineering Degree from the Free University of Brussels, Belgium and his Master's and PhD degrees in Electrical Engineering from the University of Wisconsin. From 1985 to 1994 he worked for Siemens Energy and Automation in Minneapolis, MN, on the development of advanced software for power system operation.

Currently he is Professor at the University of Manchester (UK) and Head of the Electrical Energy and Power Systems research group. His research focuses on how to balance the cost, reliability and environmental impacts of electrical energy. He is a

Fellow of the IEEE and the IET. He was elected to the UK Royal Academy of Engineering in 2010. Industry (Areva, Alstom), agencies (BPA, PNNL), several venture partners, and the UW Center for Commercialization coordinated efforts to support Daniel's hire.

Already Daniel has a strong track record working with local and national energy industry and agencies. For example, to verify his energy management methods, he developed experimental test beds in small communities in the UK. To support local participation, iSTAR funding for Kirschen will be used in part for industry engagement in a statewide summit and visits to companies in different regions of the state during the spring.

Daniel Kirschen's research is closely aligned with Washington State strategic initiatives in clean energy and smart grid, and ensures cooperation with state companies, agencies such as BPA and NWCC, and existing UW and WSU research programs.

*For more information regarding this program update, contact:*

#### **John Lederer**

*Higher Education Coordinating Board*

*Phone: (360) 753-7822*

*Email: [johnle@hecb.wa.gov](mailto:johnle@hecb.wa.gov), or go to*

*<http://www.wastars.org>*