Department of Chemical and Environmental Engineering

2015—2016 Seminar Series

Wednesday, January 6, 2016

9:00-10:00am

Winston Chung Hall 205/206

Paul Gilna

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The BioEnergy Science Center: Overview and Progress Update

The primary goal of the BioEnergy Science Center (BESC) is to enable the emergence of a sustainable cellulosic biofuels industry by leading advances in science and science-based innovation resulting in removal of recalcitrance as an economic barrier. This overview of the center will discuss advances that have been made in our two focused approaches to overcoming recalcitrance: the development of microbial strains capable of consolidated bioprocessing, and the development of improved feedstocks for biofuels. However, recalcitrance, or overcoming the inability to easily access the sugars and other monomers from cellulosic sources in order to make fuels or other products, is one of the major challenges for cost-effective biofuel production. Transformative advances to understand biomass recalcitrance require detailed scientific knowledge of (1) the chemical and physical properties of biomass that influence recalcitrance, (2) how these properties are altered in engineered or native plant biosynthetic pathways in Populus and switchgrass, and (3) how cellulolytic anaerobic microorganisms are effective in biomass deconstruction as can be improved in their fuel production. The multidisciplinary and multi-institutional BESC team is applying the knowledge gained from these activities to carry out approaches based on both improved plant and microbial components to improve generation of fuels from biomass resources as well as enabling technologies (www.bioenergycenter.org).

Biosketch: Dr. Paul Gilna is the director of the BioEnergy Research Center (BESC) at Oak Ridge National Laboratory. As the BESC Director, Dr. Gilna leads a basic and applied research project underlying the development of more cost effective transformation of biomass products into biofuels. The research focuses on understanding and overcoming the difficulty in converting cellulosic, or woody, products into sugars, which are in turn fermented into biofuels. BESC includes 17 research partners from other national laboratories, universities, and private corporations. BESC is in turn a partner with two other centers, the Joint BioEnergy Institute at the Lawrence Berkeley National Laboratory and the Great Lakes Bioenergy Research Center at the University of Wisconsin. BESC is funded at $25 million per year from the Department of Energy's Office of Science, Office of Biology and Environmental Research. Dr. Gilna's career has been spent at the intersection of computation and biology. After receiving his Ph.D. in pharmacology from University College Dublin, Gilna focused his research on the field of molecular biology. Papers summarizing his postdoctoral work on cloning and sequencing of human estrogen and progesterone receptors became the basis of genetic testing for predisposition to breast cancer. Gilna shifted his work to focus on the field of computation biology, taking a position at GenBank, the collection of publicly available gene sequences then managed out of Los Alamos National Laboratory (LANL). At GenBank, Gilna was instrumental in developing the now widely

accepted requirement that authors of journal articles submit gene sequences to GenBank in exchange for an accession number printed with the article. His work to set up computational tools and annotated genetic-sequence databases through GenBank has aided the research of countless scientists. Gilna remained with GenBank until it moved to the National Institutes of Health. He then took a position as a Program Director at the National Science Foundation's Division of Biological Infrastructure, spending two years there before returning to LANL. Before coming to ORNL and BESC, Gilna was the Executive Director at the Community Cyberinfrastructure for Advanced Marine Microbial Ecology Research and Analysis project (CAMERA), a program devoted to creating a community resource focused on enabling microbial ecology research using next generation genomics technologies. The project was located at the

California Institute for Telecommunications and Information Technology (Calit2) and the Center for Research in Biological Systems, both at the University of California, San Diego. The CAMERA project was funded by the Gordon and Betty Moore Foundation. Gilna is a former Director of the Department of Energy's Joint Genome Institute (JGI) operations at LANL, has served in the management role of Group Leader of Genomic Science and Computational Biology at LANL and has also served as Division Director of LANL's Bioscience Division. He has served as editor of the journal *DNA Sequence* and *Genomics*, and has served on grant review panels for the National Science Foundation (NSF), the Department of Energy (DOE), the Defense Advanced Research Projects Agency (DARPA), the Office of Naval Research as well as a number of international review panels in the European Union. Gilna has also served on the Executive Advisory Council for the San Diego Supercomputing Center and is currently a member of the Board of Directors of Leidos Biomedical Research, Inc. (formerly SAIC-Frederick, Inc.)

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