

# INVITED SPEAKER SEMINAR

## IN ELECTRICAL AND COMPUTER ENGINEERING

### Co-Sponsored By:

Department of Electrical and Computer Engineering, Concordia University and  
IEEE Montreal Section

**Friday, February 2, 2018**

**10:00am–11:30am**

**Room SGW-EV 03.309**

**1515 Ste. Catherine St. W.**

**" Progress in understanding the electron transport processes within the wide energy gap semiconductors: the past, the present, and the future."**



### **Dr . Stephen K. O'Leary**

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## **ABSTRACT**

Wide energy gap semiconductors exhibit higher breakdown field strengths, elevated peak and saturation electron drift velocities, and pronounced thermal conductivities. This constellation of material properties has allowed for the wider energy gap semiconductors to serve as the active materials within novel electronic and optoelectronic device applications for which conventional semiconductors prove inadequate. This realization has fueled considerable interest into the wide energy gap semiconductor family of materials. In this talk, I will provide some perspective on this burgeoning field of research, focusing specifically on the progress that has been made in understanding the electron transport processes that occur within the wide energy gap semiconductors and how these processes contrast with those associated with the more conventional semiconductors. Following some historical overview, which is aimed at putting the current work in its context, the current research of characterizing the electron transport processes within zinc oxide and boron nitride and the zinc-blende phases of gallium nitride and indium nitride will be surveyed. Both steady-state and transient electron transport results, acquired through the use of Monte Carlo simulations of the electron transport, will be presented. Some possible future topics of research, that we believe have the potential to become important over the next five-years, will be identified.

This talk, while containing some technical information specific to electron transport is mostly aimed for a general audience of technical laypeople.

## **BIOGRAPHY**

Stephen Karrer O'Leary was born in Toronto, Ontario, Canada on June 19, 1965. He received B.A.Sc., M.Sc., and Ph.D. degrees from the University of Toronto in 1988, 1990, and 1995, respectively. He worked as a post-doctoral fellow at the University of Toronto, from the fall of 1995 until the spring of 1996, as a post-doctoral teaching fellow at Hong Kong Baptist University, from the spring of 1996 until the end of 1996, and as a visiting scientist at Rensselaer Polytechnic Institute, from the beginning of 1997 until the fall of 1998. In the fall of 1998, he assumed duties as a professor in the Faculty of Engineering at the University of Regina where he remained until June of 2006 when he moved to the University of Windsor. In December of 2008, he left the University of Windsor to join the faculty of The University of British Columbia where he is currently employed. Professor O'Leary is a registered Professional Engineer with the Association of Professional Engineers and Geoscientists of British Columbia. He is currently a member of the American Physical Society and the Materials Research Society and a Senior Member with the Institute of Electrical and Electronics Engineers.

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