VISKANTA LECTURE SERIES

LOW-TEMPERATURE, NON-EQUILIBRIUM PLASMAS: AN INTRODUCTION AND PRIMER

THURSDAY, APRIL 17TH
10:00AM-11:30AM, POTR 234

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BIO: David B. Go is the Viola D. Hank Professor of Aerospace and Mechanical Engineering and Vice President & Associate Provost for Academic Strategy at the University of Notre Dame. Prior to his current role, he was the Chair of the Department of Aerospace and Mechanical Engineering. Professor Go has published widely in the areas of plasma science and engineering, heat transfer and fluid dynamics, and chemical analysis and holds six patents and several more patent applications, leading to two licensed technologies. Professor Go has been recognized with the Air Force Office of Scientific Research Young Investigator Research Award, the National Science Foundation CAREER award, the Electrochemistry Society Toyota Young Investigator Fellowship, the Electrostatics Society of America Rising Star and Distinguished Service Awards, and the IEEE Nuclear & Plasma Sciences Society Early Achievement Award. He is an ASME Fellow, Senior Member of IEEE, and former President of the Electrostatics Society of America. Most recently, he was honored with the Outstanding Mechanical Engineer Award from Purdue University. At Notre Dame, he has received the Rev. Edmund P. Joyce, C.S.C. Award for Excellence in Undergraduate Teaching and was a Kaneb Center for Teaching and Learning Faculty Fellow. Prior to joining Notre Dame in 2008, Professor Go received his B.S. in mechanical engineering from the University of Notre Dame, M.S. in aerospace engineering from the University of Cincinnati, and Ph.D. degree in mechanical engineering from Purdue University.

ABSTRACT: Plasmas are one of the least understood states of matter. While most people know about gas, liquids, and solids, very few can identify plasma as the "4th state of matter", much less describe it. Very few universities have "Departments of Plasma Science" or "Departments of Plasma Engineering" and it can be just as hard to find a class on plasma science or engineering. In fact, if you were to Google "plasma" right now, odds are that it would bring up information about "the liquid part of blood", or more likely, the closet plasma donation center. However, plasmas, and specifically a class of plasmas called low-temperature, non-equilibrium plasmas (or gas discharges), are one of most interesting physical phenomena, combining elements of solid-state physics, statistical thermodynamics, gas dynamics, electrodynamics, fluid mechanics, and more. In this lecture, I will overview some of the basic physics and chemistry that underly low-temperature, non-equilibrium plasmas and introduce basic questions such as: What makes a plasma non-equilibrium? How is a plasma formed? What are its key properties? Are there basic scaling laws that describe plasmas? And how do any and all of these things matter when it comes to applications? I will introduce several concepts that are essential to becoming conversant in plasma physics and cover how these have led to industrial uses of plasmas. I will finish with a vision for the future, where non-equilibrium, low-temperature plasmas are essential technologies in advancing human and planetary thriving.

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