



IEEE MTT/AP Orlando Chapter & Raj Mittra Distinguished Lecture Program

“Electromagnetic Sensing and Treatment of Living Things: Using Microwaves to Detect and Treat Disease in Humans and Trees”

DATE/TIME: Friday, January 26, 2018 (5:00 PM-6:00 PM)

SPEAKER: Dr. Carey Rappaport
Distinguished Professor of Electrical and Computer Engineering
Northeastern University

ABSTRACT:

Because of their ability to penetrate and heat, electromagnetic waves have found use in several unusual applications, specifically in interaction with biological tissue. Microwave radar has been used as an anatomic imaging modality for detecting breast cancer, and THz radiation is being proposed for vulnerable plaque identification. Using a simple conformal antenna, microwave sensing of trees can alert arborists if there is an otherwise undetectable infestation of Asian Long-Horned beetle. By depositing microwave power at depth, cancerous or otherwise diseased tissue can be non-invasively heated and inactivated or ablated while sparing healthy surrounding tissue. This survey presentation will touch on a variety of life science electromagnetic applications, discussing feasibility, advantages, efficacy, and limitations of the proposed approaches.

BIOGRAPHY:



Carey M. Rappaport (IEEE M, SM 96, F 06) received five degrees from the Massachusetts Institute of Technology: the SB in Mathematics, the SB, SM, and EE in Electrical Engineering in June 1982, and the PhD in Electrical Engineering in June 1987. He is married to Ann W. Morgenthaler, and has two children, Sarah and Brian.

Prof. Rappaport has worked as a teaching and research assistant at MIT from 1981 until 1987, and during the summers at COMSAT Labs in Clarksburg, MD, and The Aerospace Corp. in El Segundo, CA. He joined the faculty at Northeastern University in Boston, MA in 1987. He has been Professor of Electrical and Computer Engineering since July 2000. In 2011, he was appointed College of Engineering Distinguished Professor. During fall 1995, he was Visiting Professor of Electrical Engineering at the Electromagnetics Institute of the Technical University of Denmark, Lyngby, as part of the W. Fulbright International Scholar Program. During the second half of 2005, he was a visiting research scientist at the Commonwealth Scientific Industrial and Research Organisation (CSIRO) in Epping Australia. He has consulted for CACI, Alion Science and Technology, Inc., Geo-Centers, Inc., PPG, Inc., and several municipalities on wave propagation and modeling, and microwave heating and safety. He was Principal Investigator of an ARO-sponsored Multidisciplinary University Research Initiative on Humanitarian Demining, Co-Principal Investigator of the NSF-sponsored Engineering Research Center for Subsurface Sensing and Imaging Systems (CenSSIS), and Co-Principal Investigator and Deputy Director of the DHS-sponsored Awareness and Localization of Explosive Related Threats (ALERT) Center of Excellence.

Prof. Rappaport has authored over 430 technical journal and conference papers in the areas of microwave antenna design, electromagnetic wave propagation and scattering computation, and bioelectromagnetics, and has received two reflector antenna patents, two biomedical device patents and four subsurface sensing device patents. He was awarded the IEEE Antenna and Propagation Society's H.A. Wheeler Award for best applications paper, as a student in 1986. He is a member of Sigma Xi and Eta Kappa Nu professional honorary societies.

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