



Nonlinear and Topological Microwave Structures



Featuring Daniel Sievenpiper
Professor
Electrical and Computer
Engineering, University of
California-San Diego

Tuesday, November 14, 2023
11:00 a.m. - Noon
Location: TSRB 118 Auditorium

Abstract: We will discuss a range of recent work centered around the theme of nonlinear and topological structures in the microwave regime. First, we have developed a suite of software tools for analyzing and identifying topological structures which allow us to easily calculate topological invariants, including our recent addition of symmetry indicators. This allows us to search for new patterns that have interesting topological properties. We also apply these tools to several two- and three-dimensional periodic structures including the simple triangular lattice and screw discontinuities in hexagonal close packed and diamond structures. We also exploit nonlinear effects to reconfigure the band structure of metasurfaces to create power dependent absorbers, and other unique applications of nonlinearity to make nonreciprocal screens. Recent work in magnetized plasmas includes the development of a simple plasma circulator, as well as plasma based topological metasurfaces. Finally we will introduce some of our new work in the use of machine learning techniques to control metasurfaces for communication and scattering applications, as well as our work in direct antenna modulation for electrically small antennas.

Bio: Professor Dan Sievenpiper joined the UC San Diego faculty in 2010. He received his BS in 1994 and his PhD in 1999 from UCLA, where he studied photonic crystals and other periodic structures, and invented the high impedance electromagnetic surface. Dan joined HRL (the former Hughes Research Laboratories) in Malibu, CA in 1999. During the following 11 years, he and his team developed new electromagnetic structures, with an emphasis on small, conformal, tunable, and steerable antennas. Dan held a variety of technical and management positions at HRL including Director of the Applied Electromagnetics Laboratory. In 2010 he joined UC San Diego, where his research is focused on artificial media, and the integration of active electronics with electromagnetic structures and antennas to enable new capabilities and applications. In 2008, Dan received the URSI Issac Koga Gold Medal, and also the IEEE Antennas and Propagation Society Piergiorgio Uslenghi Letters Prize Paper Award. In 2009, he was named as a Fellow of the IEEE, and in 2019, he was awarded the John D. Kraus Antenna Award. During 2010-2017, Dan served as an associate editor of IEEE Antennas and Wireless Propagation Letters. He also served as the chair of the IEEE Antennas and Propagation Society Administrative Committee on New Technology Directions from 2013-2014, and as the general chair of the IEEE Antennas and Propagation Symposium and URSI Radio Science Meeting which was held in San Diego in 2017. He has served as the vice chair of the ECE department from 2019 to present. Dan currently has more than 80 issued patents and more than 200 publications.

Host: Joshua Kovitz
Co-host: Ryan Westafer

Pizza and soda will be available post seminar