ICCM 21 Keynote

Smart Materials and Structures: from Morphing Aircraft to Nanoscale Magnetoelectricity

Prof. Christopher S. Lynch

This keynote talk will provide an overview of the history and future of Smart Materials and Structures Technology. Smart materials have the ability to perform as both sensors and actuators. They are integrated into composites to obtain self sensing and morphing capability; into structures to control shape, vibration, and noise; and into devices to provide functionality not otherwise available. Major research programs have focused on the development of smart materials and structures since the 1990s throughout the US, Asia, and Europe. The resulting technology has impacted applications that include aircraft, automobiles, medical devices, communications, and civil infrastructure. Today, research continues with applications ranging from improved fuel efficiency in automobiles and trucks to self powered structural health monitoring of civil infrastructure. New materials and material systems are presently under development that are providing previously unimagined functionality at ever smaller length scales. With the combining of magnetostrictive and piezoelectric materials, magnetoelectric coupling is leading to new device technologies at the nanoscale, with entirely new approaches to memory devices, antenna design, and particle manipulation. Development of the next generation of Smart Materials and Structures technology is requiring consideration of mechanisms from the nanoscale where quantum effects dominate, to the control of the optics in 20 meter mirrors in next generation space telescopes that will search for habitable exoplanets.

Short biographical statement

Professor Christopher S. Lynch completed his Ph.D. while working full time at a small company in Santa Barbara, CA developing instrumentation systems for shock wave measurements. He joined UCSB as a Post Doc where he worked on fracture mechanics of electric field coupled materials. In 1995 he joined the faculty of Mechanical Engineering at Georgia Tech where he focused his research on smart materials and structures while advancing to the rank of Professor and Associate Chair of the Woodruff School. He moved to UCLA in 2007 where he continued his research and was the first Director of the new Master of Science Online Engineering degree program, now ranked #1 by US News and World Report. He currently serves as Chairman of the Department of Mechanical and Aerospace Engineering in the Henry Samueli School of Engineering and Applied Science.

Prof. Lynch has been an active member of ASME and SPIE. He served as the chairman of the Adaptive Structures and Material Systems TC, as Chair of the Aerospace Division Executive Committee of ASME, as founder and general chair of the ASME conference on Smart Materials Adaptive Structures and Material Systems (SMASIS), and as general chair of the SPIE Smart Structures / Non Destructive Evaluation (SS/NDE) conference (2014-2015). He is currently the Editor-in-Chief of the journal Smart Materials and Structures and is a member of the Editorial Board of Multifunctional Materials (MFM). He is a Fellow of ASME and SPIE and is the recipient of the ASME Adaptive Structures Prize, and the SPIE Smart Structures Lifetime Achievement Award.