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Advances and Challenges in Bioelectromagnetics and Implantable Devices

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Over the past decade, we have witnessed significant changes in the area of bioelectromagnetics, primarily spearheaded by new opportunities that implantable devices, and medical applications in general, have offered. Enabling technologies have made possible the realization of life-changing implantable devices; bioelectromagnetic research has now the opportunity to provide answers to fundamental questions involving the coupling of electromagnetic fields to the human body. In this talk we will discuss recent advances in bioelectromagnetics with applications to devices such as an artificial retina to restore partial vision to the blind. We will discuss the relevance of bioelectromagnetic research to the understanding of neural stimulation, the development of implantable antennas, and the electromagnetic safety assessment of implantable devices. Future opportunities and research efforts will also be discussed.



Gianluca Lazzi is a USTAR Professor and the Chair of the Department of Electrical and Computer Engineering at the University of Utah, Salt Lake City, UT. Prior to his appointment at the University of Utah, he was a Professor (2006 to 2009), an Associate Professor (2003 to 2006) and an Assistant Professor (1999 to 2003) with the Department of Electrical and Computer Engineering, North Carolina State University (NCSU), Raleigh. He has authored or coauthored over 150 international journal papers or conference presentations on implantable devices, medical applications of electromagnetic fields, and antenna design. Dr. Lazzi was the Chair of Commission K (Electromagnetics in Biology and Medicine) of the U.S. National Committee of the International Union of Radio Science (URSI) (2006-2008) and was elected Fellow of the Institute of Electrical and Electronics Engineers (IEEE) in 2007 for contributions to "bioelectromagnetic and implantable devices." He was the recipient of numerous national and international awards, including the 1996 International Union of Radio Science (URSI) Young Scientist Award, a 2001 National Science Foundation (NSF) CAREER Award, a 2003 NCSU Outstanding Teacher Award, the 2006 IEEE H.A. Wheeler award, a 2008 GLOBECOM Best Paper Award, the 2009 ALCOA Foundation Distinguished Engineering Research Award, and a 2010 R&D100 and Editor's Choice Award for artificial retina research. In 2004 he co-guest-edited the special issue on "Biological effects and medical applications of electromagnetic fields" of the IEEE Transactions on Microwave Theory and Techniques, and in 2009 he was the Technical Program Committee Chair of the IEEE Antennas and Propagation International Symposium and URSI meeting in Charleston, SC. He currently chairs the IEEE Sensors Council Technical Achievement Award committee. Since January 2008, he is the Editor-in-Chief of the IEEE ANTENNAS AND WIRELESS PROPAGATION LETTERS.