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The SEMI-THERM Educational Foundation
Thermal Hall of Fame

Lifetime Achievement Award

Presented To

Dr. Alfonso Ortega

In Recognition of Significant Contributions to the Field of Electronics Thermal Management

Dr. Alfonso Ortega is the James R. Birle Professor of Energy Technology at Villanova University and Professor of Mechanical and Sustainable Engineering. He is the Director of the Laboratory for Advanced Thermal and Fluid Systems which he has led for over 30 years. He is the Founding Director of the Villanova site of the NSF Center for Energy Smart Electronic Systems (ES2) founded in 2011. He currently is the co-Director of the Villanova Strategic Initiative for Climate, Justice, and Sustainability, a university wide academic initiative. Formerly he was the Associate Dean for Graduate Programs and Research in the College of Engineering and Villanova's inaugural Associate Vice President for Research and Graduate Programs. Dr. Ortega received his B.S. from The University of Texas-El Paso, and his M.S. and Ph.D. from Stanford University, all in Mechanical Engineering. He was on the faculty of the Department of Aerospace and Mechanical Engineering at The University of Arizona in Tucson for 18 years. For two years, he served as the Program Director for Thermal Transport and Thermal Processing in the Chemical and Transport Systems Division of The National Science Foundation, where he managed the

NSF's primary program funding heat transfer and thermal technology research in U.S. universities. Dr. Ortega is a teacher of thermodynamics, thermal and energy sciences, thermal-fluid design,and experimental methods. He is an internationally recognized expert in thermal and energy management in electronic systems. He has supervised over 40 M.S. and Ph.D. candidates to degree completion, 5 postdoctoral researchers, and more than 70 undergraduate research students. He is the author of over 300 journal and symposia papers, book chapters, and monographs and is a frequent short course lecturer and consultant on thermal and energy management and experimental measurements.

He is a Fellow of the ASME and received the 2003 SEMITHERM Thermie Award and the 2017 ITHERM Achievement Award in recognition of his contributions to the field of electronics thermal management. He will receive the 2023 SEMITHERM Hall of Fame Award for his career contributions to the field.

Thermal Management of Electronic Systems 1970-2023:
An Academic Perspective

Dr. Alfonso Ortega
James R. Birle Professor of Energy Technology
Director, Laboratory for Advanced Thermal and Fluid Systems
Director, Villanova Site National Science Foundation Industry/University Cooperative Research Center on Energy Smart Electronic Systems

Abstract

Having received a Ph.D. in research related to passive air cooling of electronic systems in 1981, I have had a rare opportunity to closely follow developments and participate and lead research in thermal management for electronic systems for the past 40 years. In this presentation I will trace the trajectory of thermal management needs, primarily for computing systems, since 1970, and discuss the evolution of cooling technology to meet those needs, as I have personally encountered it. In discussing this decades long path of technology development, I will illustrate the role of academic research by selective examples of problems that have been studied in the HTTM research group at Stanford University and The Laboratory for Advanced Thermal and Fluid Systems at The University of Arizona and Villanova University, from 1981 to the present day. I will also discuss important contributions from other academic research teams that have inspired me as a researcher and have moved technology forward. In this personal journey through cooling technology development and research, I will start with the needs for high reliability passive air cooling in telecom equipment from the 1970's, early work in liquid cooling systems in the 70's and 80's, the discovery of microchannels in the 80's, the search for increasingly effective forced air cooling including the introduction of hybrid heat pipe assisted systems through the 90's and 00's, and the "re-birth" of liquid cooling in all of its forms in the 2010's and 20's including direct to chip water cooling, two-phase refrigerant cooling, and immersion cooling.