Foreword to the Special Issue on the 25th Symposium on Fusion Engineering (SOFE 2013)

THIS Special Issue of the IEEE TRANSACTIONS ON PLASMA SCIENCE (TPS) covers the 25th Symposium on Fusion Engineering (SOFE 2013) held on June 10–14, 2013 in San Francisco, CA, USA. SOFE is a biennial event organized and sponsored by the Fusion Technology Committee of the IEEE Nuclear and Plasma Sciences Society. This is the third SOFE published by the TPS. SOFE 2013 was chaired by Wayne Meier of the Lawrence Livermore National Laboratory. The symposium covers engineering and scientific advances in both inertial confinement and magnetic confinement fusion, with attendees from major fusion energy research centers worldwide. An important aspect of the meeting was increased focus on technology in fusion science and engineering. As it was in the first two issues of this special issue, the objective is to highlight the most up-to-date developments reported at the SOFE 2013 to the readership of the IEEE TPS. In general, SOFE 2013 highlighted work in the area of fusion engineering, including ITER and experimental fusion devices including alternate fusion confinement devices, new device design and reactor studies, divertors and plasma-material interactions (PMIs), chambers, vacuum vessels related to fusion device technology, plasma diagnostics, data acquisition and plasma control systems, safety and environmental engineering, plasma fueling, pumping and tritium handling systems, inertial fusion energy drivers, targets and related technologies, fusion device power systems, magnet engineering, and electromagnetics and electromechanics.

This year, the SOFE 2013 meeting offered an introductory short course on PMIs for fusion and industrial plasma applications. The course intended to address rising interest in the area of PMI and covered the breadth and depth of the subject in areas, including plasma-surface interactions in fusion edge plasmas, plasma processing of micro and nanoelectronics with industrial plasmas, biomaterials plasma treatments, plasma propulsion applications, and other relevant areas where the plasma/material interface plays a crucial role in materials performance and behavior. The instructors, Prof. J. P. Allain of Purdue University and Prof. B. Wirth of the University of Tennessee, are leading scientists in PMIs both in experimental and computational areas.

SOFE 2013 had over 300 contributed papers. Nearly 100 of those papers were updated by their authors and submitted to the IEEE for consideration in this Special Issue. While the quality of those papers were uniformly excellent, an extensive review and editing process was required to select a representative collection to meet our publication requirements that reflected the diversity of topics and contributing institutions that made SOFE 2013 a success. Accordingly, this Special Issue highlights a wide range of topics in fusion engineering. For example, there are several papers summarizing recent results from major fusion devices including W7-X by H.-S. Bosch *et al.*, MAST by W. Morris and J. Milnes, the HL-2A tokamak by X. Song *et al.*, and the construction status of JT-60SA by W. Spears. There are several papers dealing with the modeling, testing and manufacturing aspects of ITER. Other papers review the status of C-Mod, DIII-D and EAST. Included papers range from the structural analysis of W7-X by V. Bykov *et al.*, to the EAST tungsten divertor by Z. Zhou, to fusion licensing in Korea by G. Heo *et al.*

These are only some of the papers to be found in this Special Issue of the TPS. We are very excited to bring this Special Issue to print as an opportunity to bring attention to, as well as highlight, some of the current worldwide efforts in fusion engineering research. We especially want to thank Dr. S. J. Gitomer for working closely with us in support of this Special Issue and A. Johnson for administrative support.

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Irving J. Zatz received the B.S. degree in civil engineering and the M.S. degree in structural engineering from Cornell University, Ithaca, NY, USA, in 1975 and 1976, respectively.

He was with the Grumman Aerospace Corporation, where he was involved in a variety of aircrafts and spacecrafts, and also involved in the design and construction of the Tokamak Fusion Test Reactor (TFTR) with Princeton University's Plasma Physics Laboratory (PPPL), Princeton, NJ, USA. It was his involvement with TFTR, which led to his joining the staff with PPPL, which focuses on fusion energy research and plasma science, in 1980. He is currently a Principal Engineer with PPPL. With PPPL, he was extensively involved with the structural analysis and design of complex mechanical systems that have operating conditions in both high-heat flux and cryogenic environments. His areas of expertise include finite element analysis, nonlinear analysis, dynamic (including seismic) analysis, fatigue and fracture life assessments, and materials development and testing. He has participated in numerous domestic and international fusion energy projects and collaborations, including ITER and the Joint European Torus. Some of his major efforts have included the structural analysis of the TFTR toroidal field (TF) coils and years later, a comprehensive mechanical test program of the decommissioned TFTR TF-coils. He performed the dynamic analysis of the TFTR bumper limiters and other components, the TF-joint failure analysis and redesign on National Spherical Torus Experiment (NSTX), and recently, on the design, analysis, and construction of the soon to be completed NSTX-Upgrade. He has been actively involved with the design and analysis of ITER in-vessel coils and port plugs. He has developed a method for insulating magnets with polyimide allowing for their performance up to 350 °C without loss of structural or material integrity.

Mr. Zatz is the author/co-author of nearly 100 technical papers appearing in a variety of journals. In addition, he has been the author/co-author of numerous fusion energy structural design criteria documents, including the NSTX Structural Design Criteria and the ITER Magnet Criteria. As a member of ASME, he is currently participating on a committee tasked with the development of a code case for fusion within the ASME Boiler and Pressure Vessel Standards. He is also an active member of the American Society of Civil Engineers.

Dennis L. Youchison (SM'09) received the B.S., M.S., and Ph.D. degrees in nuclear engineering from the Pennsylvania State University, University Park, PA, USA, in 1982, 1984, and 1989, respectively.

He performed his dissertation research with the Westinghouse Research and Development Center, Pittsburgh, PA, where he performed the measurements of sputtering yields for redeposited graphite and beryllium plasma facing surfaces. From 1990 to 1993, he was an Office of Naval Technology Fellow with the Naval Research Laboratory (NRL), Washington, DC, USA. With NRL, he performed experiments to characterize plasmas used in electron cyclotron resonance plasma-assisted chemical vapor deposition of superhard coatings, including nanocrystalline diamond and cubic boron nitride films. Since 1993, he has been with Sandia National Laboratories, Albuquerque, NM, USA, where he is currently a Distinguished Member of the Technical Staff. He is responsible for high-heat flux testing and electron beam thermal processing of materials at Sandia's High Heat Flux Facility. He is the author of more than 60 papers involving experiments and engineering design activities. He currently holds four U.S. patents. His current research interests include the development of materials for extreme environments, and the design of plasma facing components and advanced high-temperature heat exchangers.

Dr. Youchison is a licensed Professional Engineer in the state of New Mexico. He is a member of the American Nuclear Society and the American Society of Mechanical Engineers. He was the recipient of two Sandia Employee Recognition Awards and a DOE Office of Science appreciation award.

Hans-Stephan Bosch received the Dipl.Phys. degree from Ludwigs-Maximilians University, Munich, Germany, the Dr. rer. nat. degree from the Technical University, Munich, and the Habilitation degree from the Humboldt University of Berlin, Berlin, Germany, in 1983, 1986, and 2000, respectively.

He has been a Lecturer with the Ernst Moritz Arndt University, Greifswald, Germany, since 2008. His current research interests include plasma edge and divertor physics. In 2004, he became the Division Head of Project Coordination for Wendelstein 7-X. He is currently the Associate Director of the Wendelstein 7-X project and Division Head of W7-X Operations with the Max-Planck-Institute for Plasma Physics, Greifswald.

William P. Cary received the B.S. and M.B.A. degrees with over 34 years of experience in the fusion energy research field, with particular emphasis on heating and current drive systems. This experience was gained while working with both the Princeton University Plasma Physics Laboratory (PPPL), Princeton, NJ, USA, and with the DIII-D National Fusion Facility, San Diego, CA, USA. At PPPL, he primarily worked on the PLT device where he was responsible for the ICRH and LH radio frequency systems, and the Neutral Beam high-voltage power supplies. At the DIII-D facility, he was responsible for the installation and operation of the ICRH systems as well as the early gyrotron ECH systems. He is currently the Manager with the DIII-D Electrical Engineering Systems Group, which is comprised of the Power Systems, High-Voltage Systems, and Instrumentation and Control groups.