Guest Editorial Special Issue on Plenary, Invited & Selected Minicourse Papers From ICOPS 2017

THE IEEE International Conference on Plasma Science (ICOPS) is one of the premier professional meetings of plasma scientists from all over the world. The conference program showcases the most recent basic research discoveries in plasma science while emphasizing the various new applications and technologies of plasmas. This international conference is annually sponsored by the Plasma Science and Applications Committee (PSAC) of the IEEE Nuclear and Plasma Science Society (NPSS).

The 44th IEEE ICOPS 2017 was held from May 21, 2017 to May 25, 2017, in the world-famous resort destination of Atlantic City, NJ, USA, at the Waterfront Conference Center of the Harrah's Resort on the eastern Atlantic coast of the United States of America. The selection of New Jersey for ICOPS 2017 was very special due to the various important pioneering discoveries in the early historical development of plasma science and technology. Such early plasma research pioneers as Irving Langmuir and Daniel McFarlan Moore and in later years Lyman Spitzer did their seminal work in New Jersey. The technical program of the conference covered a vast array of topics, ranging from basic and fundamental research to established and emerging technological applications of plasmas. Over 550 research presentations were accepted, representing scientists from nearly 50 countries and over 400 participants.

The technical program of ICOPS 2017 was anchored by seven notable plenary sessions and a program of invited talks given by prominent scholars, international award winners, and fellows of IEEE. The plenary sessions were given by international, award winning leaders in plasma science. Alan Phelps of the University of Strathclyde, Glasgow, U.K., the recipient of the 2017 PSAC Award, in his plenary talk gave an inspirational overview on his career work on high-power millimeter-wave sources. Alexander Fridman of Drexel University, Philadelphia, PA, USA, presented a plenary talk on his pioneering work in plasma medicine. The plenary session given by Anne Bourdon of the National Center for Scientific Research (CNRS), École Polytechnique, Palaiseau, France, focused on her trailblazing simulation research work on nanosecond spark discharges for plasma-assisted combustion. Filippo Capolino of the University of California, Irvine, CA, USA, discussed in his plenary talk recent breakthrough research on plasmonics and metamaterials. Holger Kersten of the Institute of Experimental and Applied Physics, University of Kiel, Kiel, Germany, focused his plenary on his innovative diagnostic techniques for plasma processing. For his plenary presentation, Meyya Meyyappan of the NASA Ames Research Center, Mountain View, CA, USA, the recipient of the 2016 IEEE NPSS Merit Award concentrated on his influential research on the application of low-temperature plasmas for nanotechnology. The final plenary was presented by Chandrashekhar Joshi of the University of California, Los Angeles, CA, USA, the 2017 recipient of the prestigious IEEE Marie Sklodowska-Curie Award, who discussed his seminal and pioneering research on plasma accelerators. Furthermore, for the very first time in the history of ICOPS, all the plenary talks were live broadcasted freely on the internet which allowed for over 600 additional plasma researchers from all over the world to experience and remotely participate in ICOPS 2017.

Aside from the highly regarded technical program, this year's conference hosted two professional networking and social events with an inspirational panel discussion on the topic of "Challenges and Solutions to Issues Women Face in Science and Engineering" during the IEEE Women in Engineering Event and additionally the IEEE Young Professionals Symposium featured a motivating talk on scientists' important role in political leadership presented by Andrew Zwicker, an Elected Member of the State of New Jersey General Assembly and a Plasma Scientist at the Princeton Plasma Physics Laboratory, Princeton, NJ, USA.

In addition, ICOPS 2017 hosted a one-and-half day minicourse on charged-particle beams and high-powered pulsed sources offered by world-renowned experts and organized by Arati Dasgupta of the Naval Research Laboratory, Washington, DC, USA. The very high level of interdisciplinary expertise provided by the background of the minicourse instructors made for an exceptional opportunity for the participants to gain in-depth understanding of the physical phenomena, the opportunities, the applications, and the challenges in this scientific area of charged particle beams and high-powered pulsed sources.

Overall ICOPS 2017 was a rousingly successful conference helping to thrust forward the annual ICOPS conference series into the future with various new fresh ideas and unique perspectives. This Special Issue seeks to capture the excitement of ICOPS 2017 by providing several research manuscripts on the various offered plenary, invited, and tutorial minicourse presentations. We openly thank the authors, as well as the many anonymous manuscript reviewers, for their hard work and contributions to this special issue. We further thank all the many conference participants and contributors especially the members of the Conference Organizing Committee and the members of PSAC of the IEEE NPSS for their many important contributions to the great success of ICOPS 2017.

Digital Object Identifier 10.1109/TPS.2018.2838398

The 45th IEEE ICOPS 2018 will be from June 24, 2018 to June 28, 2018, in Denver, CO, USA.

JOSE L. LOPEZ, *General Chair*
Department of Physics
Seton Hall University
South Orange, NJ, USA
jose.lopez1@shu.edu

KURT H. BECKER, *Technical Program Chair*
Tandon School of Engineering
New York University
Brooklyn, NY, USA
kurt.becker@nyu.edu

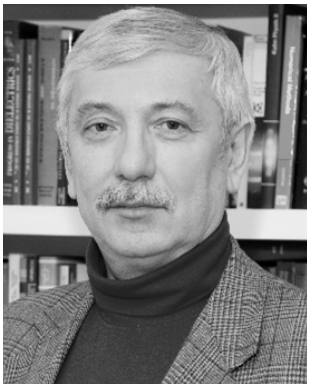
ARATI DASGUPTA, *Mini-Course Chair*
Plasma Physics Division
Naval Research Laboratory
Washington, DC, USA
arati.dasgupta@nrl.navy.mil

WEI-DONG ZHU, *Treasurer*
Department of Applied Science and Technology
Saint Peter's University
Jersey City, NJ, USA
wzhu@saintpeters.edu

Jose L. Lopez (SM'08) received the B.S. degree in physics from Saint Peter's University, Jersey City, NJ, USA, in 2000, and the M.S. and Ph.D. degrees in physics from the Stevens Institute of Technology, Hoboken, NJ, USA, in 2003 and 2006, respectively.

He is currently an Associate Professor of physics with the Department of Physics, Seton Hall University, South Orange, NJ, USA. In 2005, he joined Saint Peter's University as an Assistant Professor of physics, and was a Co-Founder of the Department of Applied Science and Technology in 2008. In 2009, he was the Founder and the Director of the Center for Microplasma Science and Technology, which is the United States Congressional designated National Center of Excellence in the scientific study of microplasmas. In 2011, he joined the Department of Physics, Seton Hall University, South Orange, NJ, USA, as a permanent tenured faculty member, where he founded the Laboratory of Electrophysics and Atmospheric Plasmas (LEAP). He is the Director of LEAP, whose research group studies, develops, and applies a wide range of theoretical and experimental techniques to understand, predict, and design novel electron-driven processes to generate plasmas with applications in lighting, energy conversion, material modification, and environmental and clean water technologies. His research has led to the development of various novel environmental remediation technologies, which use atmospheric and higher pressure plasmas to clean and remove contamination in air and water. His research with ozone generation processes using microplasmas has led to substantial increased performance and optimization of large-scale industrial ozone generators used in municipal water treatment facilities all over the world. His applied and basic scientific investigations have garnered funding of over U.S. $4 million from various sources such as the Air Force Office of Scientific Research, Department of Energy, National Science Foundation, Army Research Office, National Aeronautical and Space Agency along with various industrial partners and private research foundations. He has authored over 30 scientific publications, including the book *Complex Plasmas—Scientific Challenges and Technological Applications*.

Dr. Lopez has been nationally honored for his contributions to the United States of America by the U.S. Customs and Border Protection of the U.S. Department of Homeland Security. He was recognized in 2012 by *Inside Jersey* of the *New Jersey Star-Ledger* and *NJ.com* as one of the Top 20 Biggest Brains in New Jersey, whose exceptional intellect is changing the world. He is furthermore a highly acclaimed science communicator to broadcast mass media where he has served as a science expert to various local, national, and international news organizations such as NJ News, MSNBC, and Fox News. He additionally served as the Science and Technology Correspondent to the Emmy award-winning news panel discussion television series, *Fresh Outlook*. He served as the General Chair and the Head Organizer of the 2017 IEEE International Conference on Plasma Science held from May 21, 2017 to May 25, 2017, in Atlantic City, NJ, USA.



Kurt H. Becker (SM'02) received Diplom in Physik (M.S.) and Dr. rer. nat. (Ph.D.) degrees from Universität des Saarlandes, Saarbrücken, Germany, in 1978 and 1981, respectively.

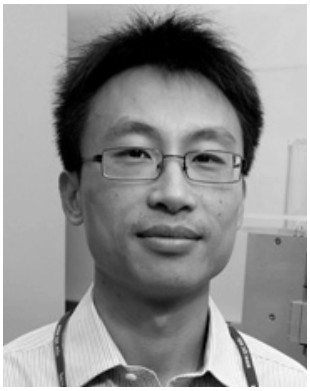
He is currently the Vice Dean for Research, Innovation, and Entrepreneurship, a Professor of applied physics, and a Professor of mechanical and aerospace engineering with the Tandon School of Engineering, New York University, Brooklyn, NY, USA. His current research interests include the properties of atmospheric-pressure microplasmas and their use in environmental, biological, and biomedical applications. He holds several U.S. and international patents on stable atmospheric-pressure plasmas and their application and was involved in their commercialization.

Dr. Becker is a fellow of the American Physical Society and the National Academy of Inventors. He was a recipient of the Dr. Eduard-Martin Prize for Excellence in Research from the Freunde der Universität des Saarlandes, the Thomas Alva Edison Patent Award, and the SASP Erwin Schrödinger Medal. He holds an Honorary Professorship from the Leopold Franzens Universität Innsbruck, Innsbruck, Austria.

Arati Dasgupta (SM'09) received the B.S. degree (Hons.) in physics and the M.S. and Ph.D. degrees from the University of Maryland, College Park, MD, USA, in 1973, 1976, and 1983, respectively.

In 1986, she joined the Naval Research Laboratory, Washington, DC, USA where she is involved in nonlocal thermodynamic equilibrium atomic and plasma modeling and simulation of high energy density (HED) plasma experiments, such as Sandia National Laboratories' multi-keV Z-pinch plasma radiation sources, various high atomic number (Z_A) radiation sources at the National Ignition Facility, Livermore, CA, USA, and radiation physics for high Z_A elements on the NRL NIKE laser in support of inertial confinement fusion (ICF). Her interdisciplinary atomic and plasma physics research spans pulsed power radiation sources, ICF, laser–matter interaction, astrophysics, and lighting.

Dr. Dasgupta is a fellow of the American Physical Society and the Washington Academy of Sciences. She has served on the Department of Energy's FESAC Committee from 2014 to 2017 and several education and program committees of the APS Divisions of Atomic, Molecular and Optical Physics and Plasma Physics. She was the Chair of the Women in Science and Engineering Committee at NRL from 2008 to 2012 and the Women in Plasma Physics Committee of the APS/DPP from 2013 to 2015. She was an Executive Member of the IEEE Plasma Science Applications Committee, IEEE Community, from 2015 to 2017. She was the organizer of several HED sessions at IEEE ICOPS conferences, lecturer of the minicourse on atomic physics of Z pinches in 2005, organizer and lecturer of the minicourse on atomic and radiation physics in the 2014 ICOPS, organizer of the minicourse on charged particle beams and high powered pulsed sources in the ICOPS 2017, Chair of the ICOPS Minicourse Subcommittee from 2015 to 2017, a Technical Area Coordinator of HEDP for the ICOPS 2018 Conference, a member of the Organizing Committee of the ICOP/PPPS 2019 Conference, and organizer of a minicourse in the ICOP/PPPS 2019 Conference. She was also on the Women in Engineering Panel on invitation at ICOPS conferences. She has provided an essay on invitation in the book *Blazing the Trail: Essays by Leading Women in Science* to inspire young women to pursue careers in science.



Wei-Dong Zhu (SM'05) received the B.S. degree in physics and education and the M.E. degree in material science and engineering from Soochow University, Suzhou, China, in 1998 and 2001, respectively, and the Ph.D. degree in physics from the Stevens Institute of Technology in Hoboken, NJ, USA, in 2005.

He is currently an Associate Professor of physics with the Department of Applied Science and Technology, Saint Peter's University, Jersey City, NJ, USA. His current research interests include fundamental studies and of the biological, biomedical, environmental applications of atmospheric pressure nonthermal plasmas, plasma sources, and excimer sources.