

TABLE OF CONTENTS

TECHNICAL BRIEFS	1
• EDTM 2017 Highlights: EDS Device Conference in Asia	
UPCOMING TECHNICAL CONFERENCES	6
• 2017 IEEE International Reliability Physics Symposium (IRPS)	
• 2017 IEEE Symposium on VLSI Technology	
SOCIETY NEWS	11
• Announcement of Newly Elected EDS BoG Members	
• Message from EDS President Elect	
• Message from EDS Vice President of Regions & Chapters	
• Message from the Editor-in-Chief	
• New Staff Joins EDS Office	
• Report from the EDS VLSI Technical Committee	
AWARDS AND RECOGNITIONS	17
• 2017 IEEE Robert Bosch Micro and Nano Electro Mechanical Systems Award Winner	
• 2017 IEEE Robert Bosch Award Call for Nominations	
• 2016 EDS J.J. Ebers Award Winner	
• 2017 EDS J.J. Ebers Award Call for Nominations	
• 2016 EDS Education Award Winner	
• 2017 EDS Education Award Call for Nominations	
• 2016 EDS Early Career Award Winner	
• 2017 EDS Early Career Award Call for Nominations	
• EDS Members Elected to IEEE Grade of Fellow	
• Congratulations to the EDS Members Recently Elected to Senior Member Grade	
• Status Report from the 2016 EDS PhD Student Fellowship Recipients	
• Status Report from the 2016 EDS Masters Student Fellowship Recipients	
• Reminder of Deadline for 2017 EDS Masters Student Fellowship Nominations	
• Reminder of Deadline for 2017 EDS PhD Student Fellowship Nominations	
YOUNG PROFESSIONALS	31
• 'Smart' Drip-Irrigation System in Nicaragua	
• Electronic Exploration Camps in Region 10	
CHAPTER NEWS	35
• Memory Day Event at Northern Virginia/ Washington D.C. Chapter	
• Inaugural IEEE International Microwave, Electron Devices, Solid-State Circuits Symposium (IMESS) 2016—Penang	
• EDS Mini-Colloquium at Pontificia Universidad Javeriana, Bogota	
• EDS Distinguished Lecture at ED Japan Chapter	
• EDS Mini-Colloquium at Santo Tomas University, Tunja	
• IEEE Puebla Section Awarded the IEEE 2016 Best Achievement Award	
REGIONAL NEWS	42
EDS MEETINGS CALENDAR	56
REMEMBERING MILDRED DRESSERHAUS	59
SUMMARY OF CHANGES TO THE EDS FIELD OF INTEREST STATEMENT	60

TECHNICAL BRIEFS

EDTM 2017 HIGHLIGHTS: EDS DEVICE CONFERENCE IN ASIA



The IEEE Electron Devices Society (EDS) had its first device conference in Asia—Electron Devices Technology and Manufacturing Conference (EDTM), at Toyama International Conference Center, Toyama, Japan, from February 28th to March 2nd, 2017, (<http://ewh.ieee.org/conf/edtm/2017/>). Various device technology areas, packaging, process/tool, material, modeling/reliability and emerging technologies were discussed. The technical program included plenary sessions as well as 17 technical and poster sessions. The research findings were presented by researchers across the world and was attended by about 290 attendees. (website: <http://ewh.ieee.org/conf/edtm/2017/>). This issue of the EDS Newsletter captures glimpses of some of the key presentations and latest technology developments.

As an emerging field, future computation and energy harvesting for cloud and edge systems was discussed, especially on neuromorphic, memristor, CMOS and perovskite-solar-cell technologies. (*Papers from 3M-2 to 3M-5*). On the system integration for cloud and edge, requirements for packaging technology was presented to embed memory, RF and power-management components. (*Paper 4M-6, Packaging design considerations for mobile and Internet of things (IoT), Piyush Gupta, Qualcomm*). Furthermore, Through Chip Interface (TCI) technology was discussed for high-performance and low-cost interfaces between SoC-DRAM, stacked-NAND, stacked DRAM and module systems. (*Paper 4M-1, System Integration in a Package for Cloud*)

(continued on page 3)

YOUR COMMENTS SOLICITED

Your comments are most welcome. Please write directly to the Editor-in-Chief of the Newsletter at radhakrishnan@ieee.org

ELECTRON DEVICES SOCIETY

President

Samar Saha
Prosopient Devices
E-mail: samar@ieee.org

President-Elect

Fernando Guarin
GlobalFoundries
E-mail: fernando.guarin@ieee.org

Treasurer

Subramanian S. Iyer
UCLA
E-mail: iyer@ieee.org

Secretary

Simon Deleonibus
CEA-LETI
E-mail: simon.deleonibus.1992@ieee.org

Jr. Past President

Albert Z.H. Wang
University of California, Riverside
E-mail: aw@ee.ucr.edu

Sr. Past President

Paul K.L. Yu
University of California at San Diego
E-mail: p.yu@ieee.org

Vice President of Membership and Services

Tian-Ling Ren
Tsinghua University
E-mail: rentl@mail.tsinghua.edu.cn

Vice President of Publications and Products

Hisayo Momose
Yokohama National University
E-mail: h.s.momose@ieee.org

Vice-President of Regions/ Chapters

M.K. Radhakrishnan
NanoRel
E-mail: radhakrishnan@ieee.org

Vice President of Technical Committees & Meetings

Ravi Todi
GlobalFoundries
E-mail: rtodi@ieee.org

IEEE Newsletters

Theresa Smith
IEEE Operations Center
E-mail: tsmith@ieee.org

Operations Director

James Skowrenski
IEEE Operations Center
E-mail: j.skowrenski@ieee.org

Membership Administrator

Joyce Lombardini
IEEE Operations Center
E-mail: j.lombardini@ieee.org

IEEE prohibits discrimination, harassment, and bullying. For more information, visit <http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html>.

EDS Board of Governors (B0G)

Elected Members-at-Large

Elected for a three-year term (maximum two terms) with 'full' voting privileges

2017	TERM	2018	TERM	2019	TERM
Z. Celik-Butler	(2)	N. Bhat	(1)	J. Burghartz	(1)
S. Chung	(2)	D. Camacho Montejó	(2)	R. Huang	(2)
M. Farooq	(1)	S. Deleonibus	(1)	S. Ikeda	(1)
P. Fay	(1)	M. leong	(1)	M. Meyyappan	(1)
C. Lilley	(1)	M. Polavarapu	(1)	A. Nathan	(1)
D. Misra	(1)	R. Todi	(1)	J. Swart	(2)
H. S. Momose	(1)	D. Verret	(2)	B. Zhao	(1)
T. L. Ren	(2)				

NEWSLETTER EDITORIAL STAFF

Editor-In-Chief

M.K. Radhakrishnan
NanoRel
E-mail: radhakrishnan@ieee.org

REGIONS 1-6, 7 & 9

Eastern, Northeastern & South-eastern USA (Regions 1,2 & 3)

Mukta Farooq
GlobalFoundries
E-mail: mukta.farooq@globalfoundries.com

Central USA & Canada (Regions 4 & 7)

Karim S. Karim
University of Waterloo
E-mail: kkarim@uwaterloo.ca

Southwestern & Western USA (Regions 5 & 6)

Kyle H. Montgomery
Air Force Research Laboratory
E-mail: kyle.h.montgomery@ieee.org

Latin America (Region 9)

Joao Antonio Martino
University of Sao Paulo
E-mail: martino@lsi.usp.br

REGION 8

Eastern Europe

Daniel Tomaszewski
Institute of Electron Technology
E-mail: dtomasz@ite.waw.pl

Scandinavia & Central Europe

Mariusz Orlikowski
Lodz University of Technology
E-mail: mariusz@dmcs.p.lodz.pl

UK, Middle East & Africa

Jonathan Terry
The University of Edinburgh
E-mail: jonterry@ieee.org

Western Europe

Jan Vobecky
Abb Switzerland Ltd.
E-mail: vobecky@fel.cvut.cz

REGION 10

Australia, New Zealand & South East Asia

P Sushitha Menon
Universiti Kebangsaan Malaysia
E-mail: susi@ukm.edu.my

Northeast Asia

Kuniyuki Kakushima
Tokyo Institute of Technology
E-mail: kakushima@ep.titech.ac.jp

East Asia

Ming Liu
Institute of Microelectronics
E-mail: liuming@ime.ac.cn

South Asia

Manoj Saxena
University of Delhi
E-mail: msaxena@ieee.org

CONTRIBUTIONS WELCOME

Readers are encouraged to submit news items concerning the Society and its members. Please send your ideas/articles directly to either Editor-in-Chief or the Regional Editor for your region. The e-mail addresses of all Regional Editors are listed on this page. E-mail is the preferred form of submission.

NEWSLETTER DEADLINES

ISSUE	DUE DATE
January	October 1st
April	January 1st
July	April 1st
October	July 1st

The EDS Newsletter archive can be found on the Society web site at <http://eds.ieee.org/eds-newsletters.html>. The archive contains issues from July 1994 to the present.

IEEE Electron Devices Society Newsletter (ISSN 1074 1879) is published quarterly by the Electron Devices Society of the Institute of Electrical and Electronics Engineers, Inc. Headquarters: 3 Park Avenue, 17th Floor, New York, NY 10016-5997. Printed in the U.S.A. One dollar (\$1.00) per member per year is included in the Society fee for each member of the Electron Devices Society. Periodicals postage paid at New York, NY and at additional mailing offices. Postmaster: Send address changes to IEEE Electron Devices Society Newsletter, IEEE, 445 Hoes Lane, Piscataway, NJ 08854.

Copyright © 2017 by IEEE: Information contained in this Newsletter may be copied without permission provided that copies are not used or distributed for direct commercial advantage, and the title of the publication and its date appear on each photocopy.

EDTM 2017 HIGHLIGHTS: EDS DEVICE CONFERENCE IN ASIA

(continued from page 1)

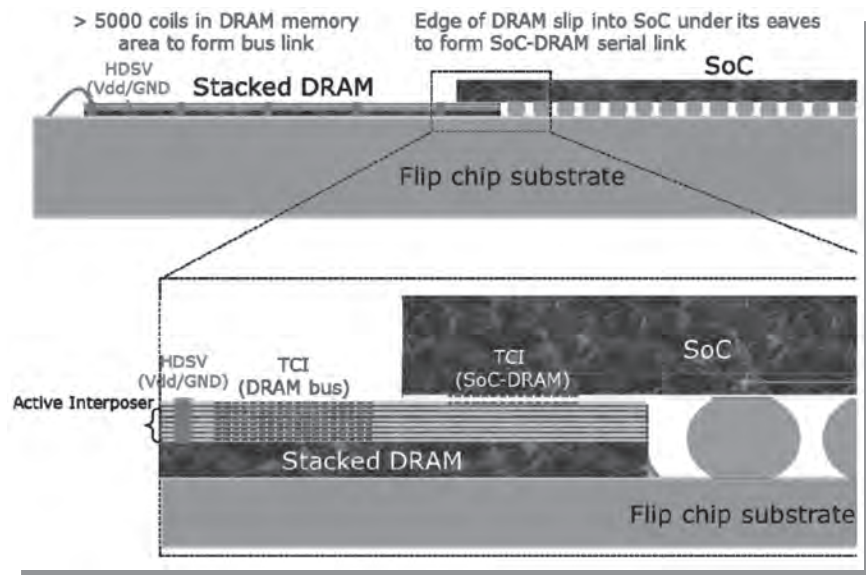
and Edge, Tadahiro Kuroda, Keio University).

In the packaging field, Outsource Assembly and Test (OSAT) approach for cloud and edge devices was presented along with newly-developed panel level package (PLP) technology. (Paper 4M-3, Focused technologies in near future from OSAT view point, Akio Katsumata et al., J-DEVICES).

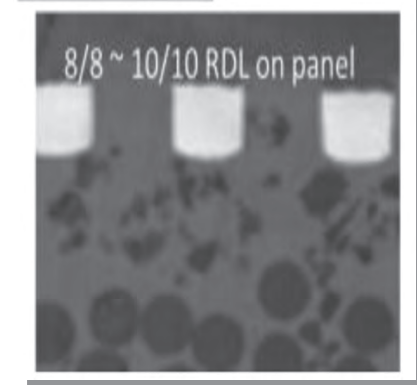
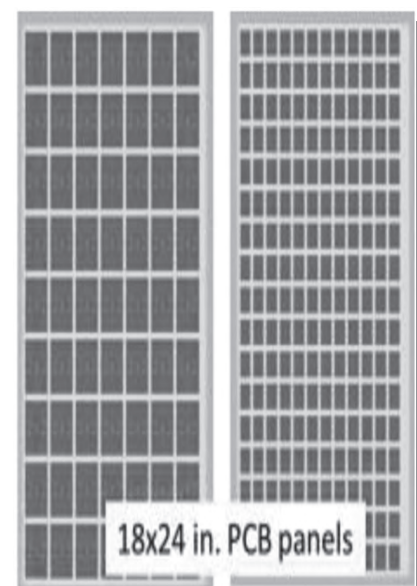
Furthermore, the advanced packaging technology was presented by TSMC, in which their strategy for heterogeneous integration was introduced, including InFO, CoWoS and panel technologies. It was discussed that fan-out panel level packaging aims for lower cost with larger panel substrate. It is more suitable for lower pin-count and smaller size packages. Its' feasibility for higher

performance, higher density, and multi-layer re-distribution layer (RDL) remains. (Paper PL-3, Advanced Heterogeneous Integration Technology Trend for Cloud and Edge, Douglas C.H. Yu, TSMC).

In the process and tool fields, the significant progress of EUV scanner (NXE:3350B) was presented on 16-nm/20-nm line/space and 115-W source for high-volume manufacturing

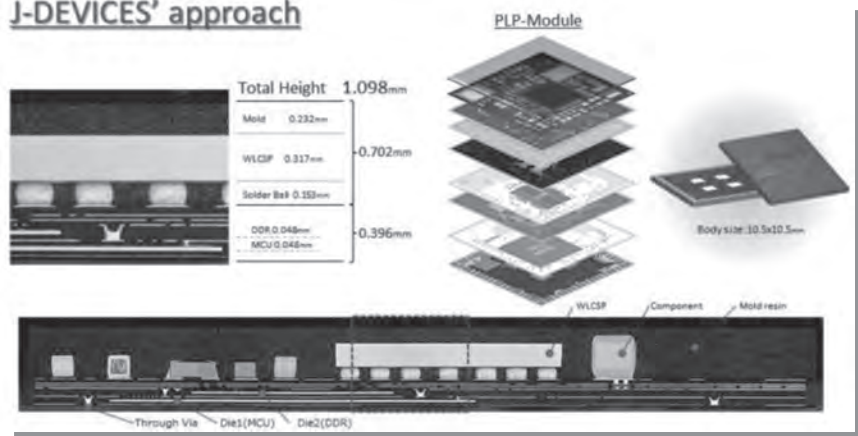


100-GFLOPS/W computer using TCI between SoC-DRAM interface. (Re: Tadahiro Kuroda, EDTM 2017, paper#4M-1)

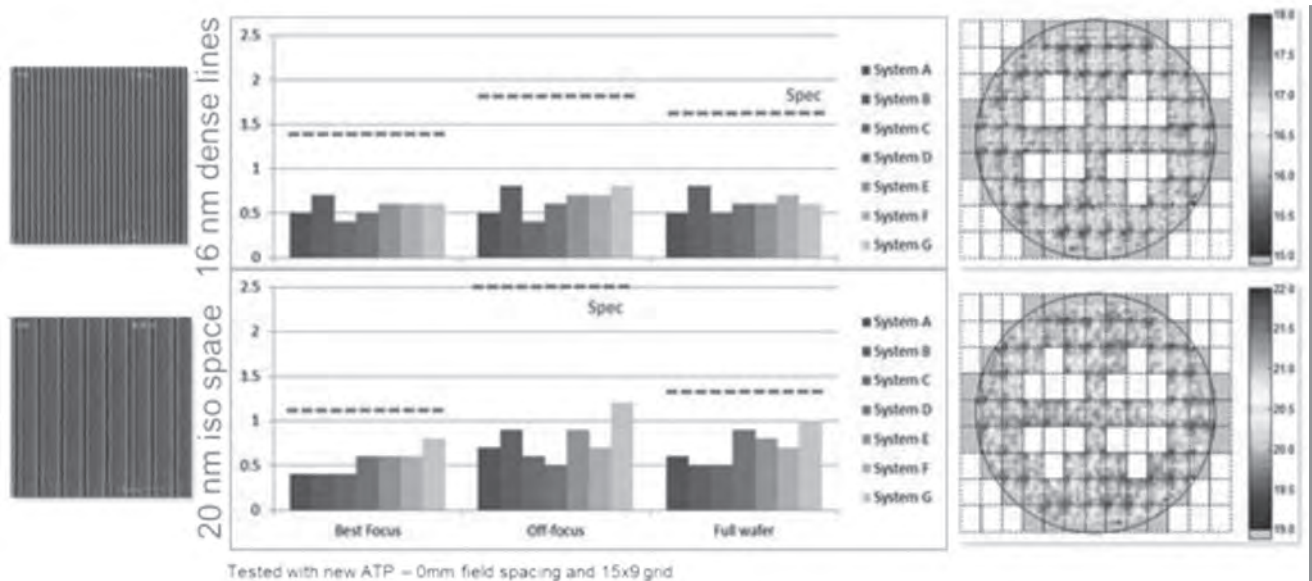


Plane illustration of larger panel substrate for lower cost fan-out panel level packaging (upper); Cross-sectional SEM image for higher-density and multi-layer RDL on the panel (lower). (Ref: Douglas C.H. Yu, EDTM 2017, paper#PL-3)

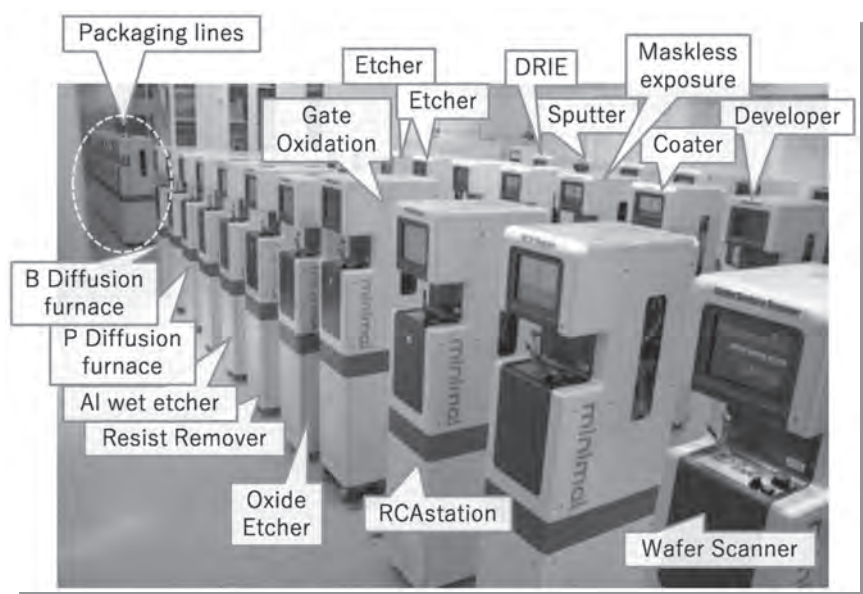
J-DEVICES' approach



System level packaging using panel level package (PLP). (Ref: Akio Katsumata, EDTM 2017, paper#4M-3)



NXE:3350B imaging: 16-nm dense and 20-nm iso space. (Ref: Alek Chen, EDTM 2017, paper#5M-1)



Minimal fab line employed for CMOS fabrication, which is established in an office. (Ref: Sommawan Khumpuang, EDTM 2017, paper#5M-3)

packaging process. (refer: Papers 4M-4, 5M-3, 5M-4, 7B-4, P-24, P-25, AIST/Minimal Fab).

As device scaling progresses towards 5/3-nm, scaling difficulties and modeling challenges were discussed in the plenary presentation by GlobalFoundries. (Paper PL-1, *Dimensions of Innovation to Enable the Next Era of Intelligent Systems*, Dr. John G. Pellerin, GlobalFoundries). Moreover, in these technology areas, Si nanowire with SiGe cladding technologies were simulated for considering the 5/3-nm technology nodes. (Paper 4B-3, *FinFET/Nanowire Design for 5nm/3nm Technology Nodes: Channel Cladding and Introducing a "Bottleneck" Shape to Remove Performance Bottleneck*, Victor Moroz et al., Synopsys).

Some of the advanced technologies for yield management were presented in terms of the on-die test element group (TEG), for built-in self-test (BIST). (Paper 6A-1, *New Visions for IC Yield Defector Detection*, Bill Nehrer, et al., PDF Solutions).

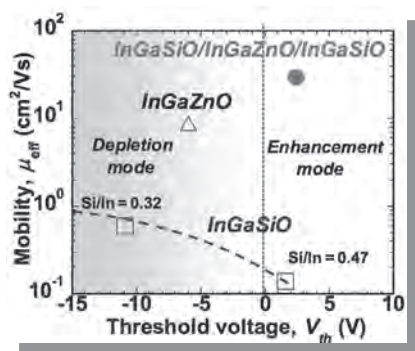
In the material and device fields, an InGaSiO/InGaZnO/InGaSiO double hetero channel TFT was proposed for Si-LSI process to achieve a higher mo-



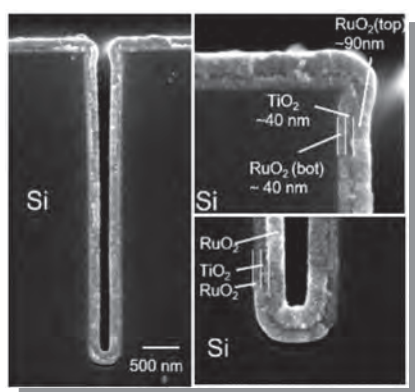
Si nanowire with SiGe cladding in the on state. (Ref: Victor Moroz, EDTM 2017, paper#4B-3)

in 2018. (Paper 5M-1, *EUV Lithography insertion for high volume manufacturing: status and outlook*, Alek Chen et al., ASML).

Furthermore, Minimal Fab technologies using a half-inch wafer were introduced through the papers on CMOS inverter, ECR-plasma SiN film formation, ICP-RIE etching tool form MEMS, and Ball-Grid-Array (BGA)

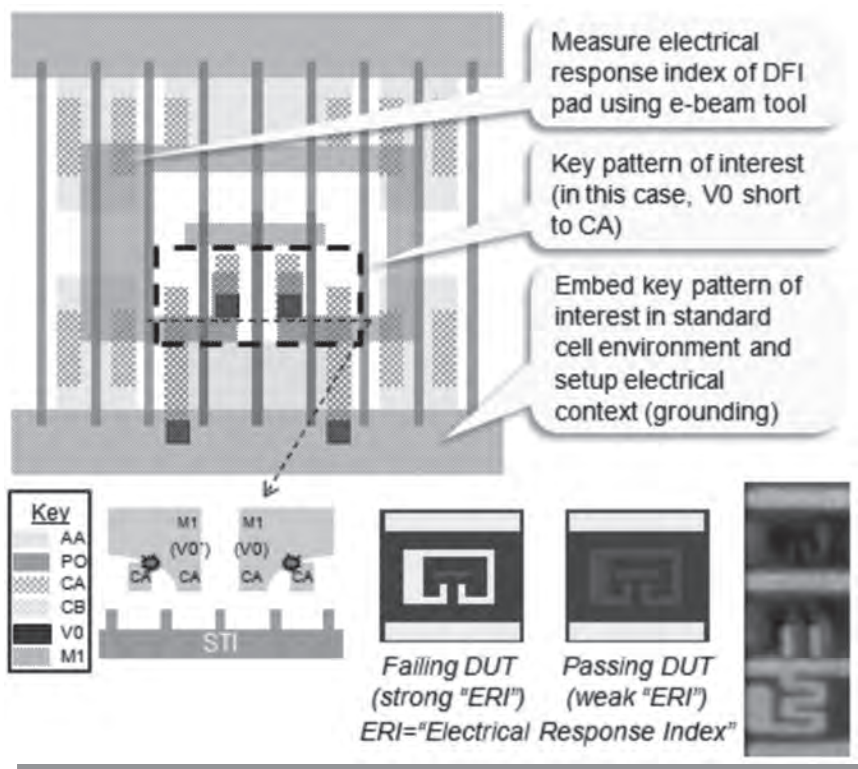


Mobility vs. threshold voltage for InGaSiO/InGaZnO/InGaSiO double-channel TFTs. (Ref: Alek Chen, EDTM 2017, paper#5M-1)



Conformal $\text{RuO}_2/\text{TiO}_2/\text{RuO}_2$ structure on 10-aspect-ratio trench. (Ref: Yu Zhao, EDTM 2017, paper#P-27)

bility and enhancement operation, simultaneously. (Paper 7A-4, High-mobility and H2-anneal Tolerant InGaSiO/InGaZnO/InGaSiO Double Hetero Channel Thin Film Transistor for Si-LSI Compatible Process, Nobuyoshi Saito et al., Toshiba).



System for embedding electrical test sites using the actual product layouts to measure the failure rates (in terms of ERI) of patterns by process. (Ref: Bill Nehrer, EDTM 2017, paper#6A-1)

A $\text{RuO}_2/\text{TiO}_2/\text{RuO}_2$ MIM capacitor was achieved in high aspect ratio of 10, by using supercritical fluid deposition (SCFD) method. (Paper P-27, Supercritical fluid deposition of conformal oxide films: 3-dimensionally-stacked $\text{RuO}_2/\text{TiO}_2/\text{RuO}_2$ structures for MIM capacitors, Yu Zhao et al., University of Tokyo).

As the first EDS conference of this kind in Asia to cover all advanced tech-

nology areas, EDTM 2017 made an impact and initiated a forum for discussion by technology experts. This becomes more significant as Asia is becoming a manufacturing hub and industry-academia collaboration in the region becomes stronger.

(This article was prepared by members of the EDTM 2017 team, **Shuji Ikeda** (General Chair) and **Hitoshi Wakabayashi**, Technical Program Chair.)

UPCOMING TECHNICAL MEETINGS

THINGS ARE HEATING UP AT THE 2017 IEEE INTERNATIONAL RELIABILITY PHYSICS SYMPOSIUM (IRPS)

APRIL 2–6, 2017 HYATT REGENCY MONTEREY RESORT AND SPA, MONTEREY, CA, USA

The International Reliability Physics Symposium (IRPS) is the world's premier forum for leading-edge research addressing developments in the Reliability Physics of devices, materials, circuits, and products. IRPS is the conference where emerging Reliability Physics challenges and possible solutions to achieve realistic End-of-Life projections are first discussed.

The 2017 IRPS conference has been finalized with 19 tutorials, 17 invited talks, 82 platform presentations, and 81 posters by a globally well-represented 145 technical program committee members and chairs. The keynote speakers at IRPS 2017 will be NASA Astronaut Dr. Nancy Currie-Gregg and IBM Distinguished Engineer Mr. Ronald Newhart. Dr. Currie-Gregg, who flew on STS-57, STS-70, STS-88 (the first International Space Station assembly mission—1998) and STS-109, will speak on NASA human exploration missions and reliability challenges. Mr. Newhart, who is currently a Distinguished Engineer with IBM Systems & Technology Group, focusing on product engineering and reliability, will give a keynote speech on system level reliability challenges with technology scaling, with details posted already on Facebook, LinkedIn and Twitter. The technical program will then commence with three parallel tracks; a listing of the accepted abstracts is posted with the program in review <http://irps.org/program>. The conference has 13 technical areas, which encompass the entire reliability area of semiconductors. Unique to this year's conference are focus areas of reliability testing methods, and the use of Commercial Off the Shelf



Beautiful Monterey—a great place for a conference

(COTS) components in high reliability applications. In addition to these new topics, IRPS continues to be the premier venue in reporting emerging reliability concerns of Wide Band Gap semiconductors.

Why IRPS?

For 55 years, IRPS has been the premiere conference for engineers and scientists to present new and original work in the area of microelectronics reliability. Drawing participants from the United States, Europe, Asia, and other parts of the world, the IRPS is the only comprehensive reliability conference, that covers the breadth of device reliability for: dependent dielectric breakdown testing, models, compound device reliability, interconnect electro-migration, soft error, electronic system reliability, process integration and chip-package interaction. No other meeting presents as much leading work in so many different areas of reliability of electronic devices, encompassing both silicon and non-silicon devices, process technology, packaging, circuits

and systems reliability, photovoltaics, and MEMS. IRPS kicks off with two days of 90 minute tutorials (<http://irps.org/program/tutorials/>) given by world-wide industrial and academic experts. The semiconductor reliability neophyte wonders where, how, and when to be trained most efficiently. The well-practiced engineer wants to stay current in their reliability training and become a little more broadened in other areas. A university professor or post doctorate wants perspective. An IEEE Fellow is great in their area, but seeking other areas to lead. Since 2011, IRPS conference has offered 129×90 minute sessions with an average of over 21 unique sessions per year delivered by industry, academia, and government experts. There is no other place to have this type of exposure and training. IRPS consists of three days (Tues-Thurs, April 4–6) of plenary and parallel technical sessions presenting original, state-of-the-art work. IRPS 2017 will also offer tutorials, evening panel debates and workshops, invited plenary talks, and an outstanding technical program.

Pre-Conference Highlights

Tutorials begin with one track covering “reliability fundamentals” in silicon: FEOL, BEOL, electro migration, and chip-package interactions. The second track consists of wide bandgap (GaN), VLSI design methodology and verification, NAND flash memory, and failure analysis challenges with respect to reliability. The second day of tutorials consists of advanced topics in silicon, automotive-IoT, integrated/memories, and circuit & system reliability. The automotive-IoT track is a new focus area for IRPS with tutorials on functional safety relationship to reliability along with juggling knowledge and standards based qualification methods.

At the 2017 IRPS, there will be two entire sessions devoted to the reliability of Wide Bandgap (WBG) semiconductor devices, one for SiC and one for GaN-based devices. In the SiC tracks, 4 key speakers have been invited to discuss about the reliability of today SiC MOSFET technology. These speakers will discuss and share their recent findings on threshold instabilities, design aspects for reliable high voltage operation, transient Out-of-SOA robustness and reality aspects of ultra-high voltage SiC MOSFETs. The GaN sessions focus mainly on reliability aspects of GaN-based devices for high voltage applications. In the GaN sessions, new reliability insights, understanding and aspects of GaN-based devices in cascode-mode, power GaN-based transistors under high (reverse) voltage stress and e-mode power devices are presented. Moreover, the GaN session includes studies on the gate degradation of InAlN/AlN/GaN HEMT devices as well as the role of dislocations in carbon doped GaN buffers on Si.

The transistor and beyond CMOS subcommittee will have two sessions. In the first session, papers covering different aspects of BTI, HCI and self-heat effects will be discussed. Some aspects of variability will also be covered. In the second

session, papers will cover some of the physical mechanisms of reliability, degradation of III–V channel transistors and also some reliability aspects of novel channel materials.

Recent advancements in memory reliability will also be showcased at IRPS, including process optimization for MRAM and for vertical NAND memories as well as system-level approaches for SSDs. The emerging memory field is also represented, with studies on RRAM variability and error recovery.

In the dielectric session it will be demonstrated that Weibull distribution is insufficient to represent the complexities of FinFET degradation with solid statistical and physical evidence. The novelty lies in the unified understanding gained using physical analysis tools (HR-TEM with EELS and EDX) and percolation framework based statistical derivation to justify the need for a clustering model. Also there will be the first reports probing the breakdown phenomenon in a few (2L/3L) layered fluorinated graphene (FG) stacks at sub-nanoscale resolution in ultra-high vacuum (UHV). Experimental evidence of stress induced degradation and breakdown (BD) at nanoscale, progressive shrinkage of bandgap and multimodal BD distributions will be presented at the symposium.

The metallization reliability session will present the recent investigation of novel interconnects for continuous scaling, that include a) Cobalt or Ruthenium-filled interconnects, b) doped Graphene-Nanoribbon (GNR) interconnect, c) new low-resistivity ALD-W capping, and d) atomically thin diffusion barriers. Also, there will be reports covering the effects of self-heating on electromigration and stress-migration, as self-heating becomes a limiting factor for semiconductor reliability.

The Circuit Reliability/Aging session includes innovative papers on a wide range of topics. A thermally aware aging sensor design implemented in a 20nm SoC illustrates

the advantages of incorporating such sensors to bound FEOL aging without exceeding the power constraints. Further, a novel on-die wave-front generator circuit is used to generate realistic AC waveforms to stress transistors as they would be in actual high-speed I/O applications. Also, a Physically Unclonable Function (PUF) is demonstrated by taking advantage of the intrinsic randomness of gate oxide breakdown position as the entropy source.

The Product session will cover the latest industry trends on qualification, advancing the discussion on how we'll ensure next generation technologies are comprehended at the product level. Platform and Poster presentations will span a variety of product segments, from Automotive to CPUs to FPGA and beyond.

The packaging sessions reflect recent industry trends toward scaling through the package in 2.5/3D designs. The sessions will feature reliability results from new package architectures accomplished using new applications of build-up processes as well as through interposers. The comparative reliability impact of a TSV-middle process on front-end of line (FEOL) devices and back-end of line (BEOL) structures will be presented. TSV orientation relative to FinFET device orientation was studied. One comparative example shows the gate-oxide breakdown voltage (VBD) for thin and thick gate-oxide devices at a keep out zone (KOZ) distance of 3 μm from the TSV compared to the reference devices.

Innovative findings on the threat of soft error in advanced electronic devices will also been reported, in particular: i) new insights on back bias effect on SOI SRAM soft error rate, ii) Pioneering results on Polonium diffusion effect on alpha emission rate and related soft errors; iii) The re-emergence of thermal-neutron soft error in 16-nm FinFETs and Soft errors in 10-nm FinFET. Furthermore, an invited talk on autonomous driving, discussing the challenges of

implementing a safe, secure, complex driver assistance system will complete the session.

The photovoltaic session shows innovative findings on reliability of organic and inorganic solar cells. Innovative modeling and characterization techniques for the polymeric solar cells, as new tools for comparing the reliability and performances of different materials, as well as a method for investigating the degradation mechanisms of organic solar cells will be discussed. The profound difference of behavior between forward and reverse bias stress on thin film silicon solar cells, showing a clear evidence of the range of wavelengths of the photons needed to assist the recovery effect under DC voltage stress will also be presented. The severe effects of potential-induced damage will also be reported, demonstrating that a significant number of PV modules installed are PID sensitive, and highlighting the importance to detect and recover the PID affected PV modules in an early stage in order to be able to recover them to an acceptable level.

The inaugural year of the Reliability Testing session will focus on the test equipment and methods that are used to design and perform modern reliability tests. Platform presentations will include topics ranging from product level reliability test concerns, to novel circuit level test structures, and device level defect detection using ultra high speed measurement. The practical aspects of testing will be explored along with the underlying physics of reliability.

Reliability of wide variety of systems will be presented at the systems reliability session. Systems will include mobile displays, Space systems with focus on commercial of the shelf (COTS) components, ceramic capacitors based systems, counterfeit electronics and semiconductor systems. In addition, two approaches will be presented to gather and assimilate data to improve reliability of systems. One approach is to gather



Management Committee Meeting, December 2016. First row from left: Gaudenzio Menghesso (Publications & Publicity Chair), Mark Porter (Technical Program Chair), Charles Slayman (Audio Visual Chair), Cathy Christiansen (Workshops Chair), Yen-Hao Shih (Arrangements Chair). Second row from left: Koji Eriguchi (Publicity Co-Chair—Asia) Jason Ryan (Communications Chair & Secretary), Susumo Shuto (Registration Chair), Yuan Chen (General Chair), Chris Connor (Tutorials Chair), Robert Kaplar (Finance Chair), Vincent Huard (Presentations Chair), Christine Hau-Riege (TP Vice Chair)

telemetry data from the device in the field and guide the system design based on this data to improve field reliability. Second approach is data-driven hybrid physics-based technique for reliability allocation in early product development stages such that more reliable products can be designed for the customer.

Other opportunities at the symposium include:

- **Year in Review Session (Monday April 3).** These seminars provide a summary of the past year's most noteworthy research and development in the field of microelectronics reliability. The distinguished speakers cull information from the recent literature and product announcements and provide an expert's interpretation of the impact. The Year in Review session helps the attendees to stay current with the recent reliability literature.
- **Evening Poster Session.** The poster session will provide an additional opportunity for authors to present their original research. The setting is informal and allows for easy discussion between authors and other attendees.

• **Evening Session Workshops.**

These workshops enhance the symposium by providing the attendees an opportunity to meet in informal groups to discuss key reliability physics topics with the guidance of experienced moderators. All conference attendees are invited to join discussions of one or more of six topic areas, including self-heating effects on transistor reliability, expectations of extrinsic reliability in high reliability vs. low cost markets, middle of line dielectric models, GaN reliability testing, solid state drive reliability, and consumer off the shelf components in high reliability systems. These workshops provide excellent networking opportunities, as well as a forum for lively debate on the best approaches to characterizing and controlling reliability.

- **Vendor Exhibits.** Held in parallel with the technical sessions, the equipment demonstrations provide a forum for manufacturers of state-of-the-art laboratory equipment to present their products. Attendees are encouraged to visit the manufacturers'

booths for information and demonstrations.

- **IRPS Paper Awards.** IRPS bestows awards for Best Paper, Outstanding Paper, Best Poster and Best Student Talk. The Best Paper author is typically invited to present the paper at ESREF in October.

The Conference center at the Hyatt Regency Monterey Hotel and Spa captures an atmosphere of intense

energy and inspiration and has become a favored destination for corporate meetings, business retreats, training sessions and conferences.

Please take advantage of registration now for lower conference fees and follow us on Facebook, LinkedIn, Twitter @IEEEIRPS, or visit <http://IRPS.org> for the latest information. We look forward to seeing you in Monterey!

*Yuan Chen
2017 IRPS General Chair
NASA*

*Gaudenzio Meneghesso
2017 IRPS Publicity Chair
University of Padova, Italy*

*Koji Eriguchi
2017 IRPS Publicity Co-Chair—Asia
Kyoto University*

2017 SYMPOSIUM ON VLSI TECHNOLOGY

The 37th Annual Symposium on VLSI Technology will be held from June 5–8, 2017, at the Rihga Royal Hotel in Kyoto, Japan. This symposium, jointly sponsored by the Japan Society of Applied Physics and the IEEE Electron Devices Society (EDS) in cooperation with the IEEE Solid-State Circuits Society (SSCS) is recognized as the premier international conference on VLSI semiconductor technology.

A unique aspect of this conference is that it is held jointly with the Symposium on VLSI Circuits having fully overlapping schedule to promote interactions between technologists and circuit/system designers. This year the theme for both Symposia is “Harmonious Integration towards Next Dimensions.” It reflects the needs for VLSI community to find additional dimensions to continue the exponential growth propelled by Moore’s law. This can be achieved by innovation in devices and circuits driven by new technologies, processes, and applications. A single registration fee covers both events.

Special joint focus sessions will offer unique learning opportunities for both Technology and Circuits attendees for example on “Ultra Low Power for IoT” and “Computing beyond von Neumann.” Moreover, the 2017 Symposium on VLSI Technology features technology focus sessions on “1D and 2D Atomically Thin



Materials and Devices” and “Emerging Memory Technology.”

A new Demo Session will be held on Monday evening, June 5th to enable real-time demonstration of a new device and chip operation highlighting key results and potential applications for circuit-level innovations, as well as to give visual illustration of technological concepts and analysis.

Additional highlights include:

- **Plenary sessions Technology and Circuits** with 4 talks: Takashi Tsutsui (Chief Scientist & SVP SoftBank Corporation) “5G Wireless Communication Technologies,” Fari Assaderaghi (CTO

& SVP NXP Semiconductors), “Key requirements for sustained growth of Internet of Things technology,” Hideyuki Oka (Director R&D Division, CTO, AVC Networks Company, Panasonic Corp) “Perspective view on IoT AI and Robotics and Expectation towards VLSI” and Daniel Rosenband (Google) “The brain of Automated Driving—Electronics for the vehicle of tomorrow.”

- **Three Evening Panel Discussions:** “How will we survive the post-scaling era?” (Joint Technology/Circuits), “Transistor Future: How does it evolve after FinFET Era?” (Technology) and “Most important

Circuits of 2037" (Circuits) moderated by Ted Letavic (Global Foundries), Jason Woo (UCLA) and Kofi Makinwa (TU Delft), respectively.

- **Full-day short courses** on "Technology enables for 5nm and next wave of integration" (Technology) and "Integrated Circuits for Smart Connected Cars and Automated Driving" (Circuits).

Two satellite workshops will be held before the technical session of the symposium: "IEEE Silicon Nanoelectronics Workshop" (June 4–5)

and "Spintronics Workshop on LSI" (June 5th) at the same location.

The recently renovated Rihga Royal Hotel Kyoto offers rooms in both traditional and modern style. The hotel conveniently located a 10-minute walk from JR Kyoto Train station has an easy access to all main sightseeing attractions of ancient Kyoto.

We cordially invite you to attend the 2017 Symposium on VLSI Technology. For further information please visit the VLSI Symposia website: <http://www.vlsisymposium.org>.

Satoshi Inaba (Japan)
Symposium Chairman
Toshiba

Mukesh Khare (USA)
Symposium Co-Chairman
IBM

Meishoku Masahara (Japan)
Program Chairman
AIST

Chorng-Ping Chang (USA)
Program Co-Chairman
Applied Materials



IEEE Journal of the Electron Devices Society

The IEEE Journal of the Electron Devices Society (J-EDS) is a peer-reviewed, open-access, fully electronic scientific journal publishing papers ranging from applied to fundamental research that are scientifically rigorous and relevant to electron devices.

Please submit your manuscripts for consideration of publication in J-EDS at <http://mc.manuscriptcentral.com/jeds>.

The J-EDS publishes original and significant contributions relating to the theory, modelling, design, performance, and reliability of electron and ion integrated circuit devices and interconnects, involving insulators, metals, organic materials, micro-plasmas, semiconductors, quantum-effect structures, vacuum devices, and emerging materials with applications in bioelectronics, biomedical electronics, computation, communications, displays, micro-electromechanics, imaging, micro-actuators, nano-devices, optoelectronics, photovoltaics, power IC's, and micro-sensors. Tutorial and review papers on these subjects are also published.

As an open-access title, J-EDS provides the electron devices community:

- Faster speed of publication
- Free access to readers globally
- World-wide audience
- Increased dissemination
- High impact factor (IF)
- Articles can be cited sooner
- Articles potentially cited more frequently



SOCIETY NEWS

ANNOUNCEMENT OF NEWLY ELECTED EDS BOG MEMBERS



Albert Wang
EDS Nominations
and Elections Chair

In 2016, EDS continued its' pilot program and had one of the seven Board of Governors Member-at-Large seats elected via the entire EDS membership. The remaining six seats were voted on by our BoG during the election, which took place on December 4, 2016, at the Hilton San Francisco Union Square Hotel in San Francisco, California, USA. The following are the results of the election and brief biographies of the individuals elected.

BoG Members-At-Large Second Term Electees



Ru Huang is currently the Professor, Director of Institute of Microelectronics and Deputy Dean of School of EECS, Peking University, China. Her research interests include nano-scaled CMOS devices, nonvolatile memory devices and device reliability/variability analysis. Since 2000, she has been a leader of several State Key Research Projects in China. She has authored or coauthored four books and more than 250 papers, including more than 50 IEDM/VLSI and EDL/TED papers. She is the holder of more than 100 granted patents. She was the winner of Chang-Jiang Scholar Distinguished Professor, National Science Fund for Distinguished Young Scholars and many other awards in China, including National Award for Technological Invention. She is

an Associate Editor-in-Chief of "Science in China" and an editor of *IEEE T-ED*. She was the General Co-Chair of 2012 ICSICT, 2013 ISLPED, TPC Co-chair of 2004 and 2008 ICSICT and committee members of many other international conferences and symposiums.



Jacobus Swart received B. Engineer and Dr. Engineer Degrees in 1975 and 1981 respectively, from the Polytechnic School of the University of São Paulo, Brazil. Afterwards he worked at the following institutions: K. U. Leuven, Belgium, 1982-83, as a post-doc.; CTI, Campinas, 1984, as head of Process Engineering; LSI-University of São Paulo, 1985-88, as Assistant Professor; SID Microeletrônica, 1986; RTI, USA, 1991, as a Visiting Scientist; and UNICAMP, since 1988, as Full Professor. He served as director of the Center for Semiconductor Components, 1998-2005 and as Director of CTI, 2007-2011. He is currently an Imec representative in Brazil. He is ranked as fellow researcher, level 1A (highest), at CNPq and is a Fellow of IEEE and of the São Paulo State Academy of Science. He is currently the leader of a large research network in Brazil, called NAMITEC.

First-Time Electees



Joachim N. Burghartz is the director of the Institute for Microelectronics Stuttgart (IMS CHIPS) and full professor at the University of

Stuttgart, Germany. Previously, he worked from 1987 through 1998 for IBM at the T.J. Watson Research Center in Yorktown Heights, New York, USA. From 1998 through 2005 he was with Delft University of Technology, in the Netherlands, as a full professor and, from 2001 through 2005, as the Scientific Director of the research institute DIMES.

Joachim Burghartz has published more than 350 reviewed articles and holds 22 patents. He is an IEEE Fellow, recipient of the J. J. Ebers Award of the IEEE Electron Devices Society (EDS), served as Vice President Technical Activities of IEEE EDS from 2009 through 2013, and was initiator and editor of the EDS anniversary book 'Guide to State-of-the-Art Electron Devices' dedicated to the 60th/35th anniversaries of electron devices in IRE and IEEE.



Shuji Ikeda is the CEO of tei Solutions Inc. He received the B.S. degree, PhD. from Tokyo Institute of Technology, Tokyo, Japan and the M.S.E.E.

degree from Princeton University, New Jersey. He joined Hitachi Japan, in 1978, where he was engaged in research and development of state-of-the-art SRAM process and devices. He was also working on developing process technology for LOGIC, embedded-memories, and RF devices. He also transferred technology to mass production line. In 2005, he joined SEMATECH/ATDF, where he developed various kinds of technologies including scaled CMOS, non-classical CMOS, new materials/tools.

In 2010, he established tei Solutions Inc.

He holds over 200 patents in Japan and more than 70 patents in the U.S. He chaired IEDM in 2002. He serves as a chairman of VLSI committee of EDS from 2009. He is chairing a new EDS flagship conference, EDTM (Electron Devices Technology and Manufacturing Conference), in February 2017.



Meyya Meyyappan is Chief Scientist for Exploration Technology at NASA Ames Research Center. He has authored over 345 peer-reviewed

articles and given over 400 talks. He is a Fellow of the IEEE, ECS, AVS, MRS, IOP, AIChE, ASME and National Academy of Inventors. For his contributions and leadership in nanotechnology, he has received: a Presidential Meritorious Award; NASA's Outstanding Leadership Medal; IEEE Judith Resnick Award; IEEE-USA Harry Diamond Award; AIChE Nanoscale Science and Engineering Forum Award; Pioneer Award in Nanotechnology by the IEEE-NTC; Sir Monty Finniston Award by the IET; IEEE-USA Professional Achievement Award; AVS Nanotechnology Recognition Award; IEEE NPSS Merit Award. He was inducted into the Silicon Valley Engineering Council Hall of Fame in 2009. He received an Honorary Doctorate in 2015 from the University of Witwatersrand, Johannesburg, South Africa. For his educational contributions, he has received the IEEE EDS Education Award, and the IEEE EAB Meritorious Achievement Award in Continuing Education.



Arokia Nathan holds the Professorial Chair of Photonic Systems and Displays in the Department of Engineering, Cambridge Uni-

versity. He received his PhD in Electrical Engineering from the University of Alberta. Following post-doctoral years at LSI Logic Corp., USA and ETH Zurich, Switzerland, he joined the University of Waterloo where he held the DALSA/NSERC Industrial Research Chair in sensor technology and subsequently the Canada Research Chair in nano-scale flexible circuits. He was a recipient of the 2001 NSERC E.W.R. Steacie Fellowship. In 2006, he moved to the UK to take up the Sumitomo Chair of Nanotechnology at the London Centre for Nanotechnology, University College London, where he received the Royal Society Wolfson Research Merit Award. He has held Visiting Professor appointments at the Physical Electronics Laboratory, ETH Zürich and the Engineering Department, Cambridge University, UK. He has published over 500 papers in the field of sensor technology and CAD, and thin film transistor electronics, and is a co-author of four books. He has over 50 patents filed/awarded and has founded/co-founded four spin-off companies. He serves on technical committees and editorial boards in various capacities. He is a Chartered Engineer (UK), Fellow of the Institution of Engineering and Technology (UK), Fellow of IEEE (USA), and an IEEE EDS Distinguished Lecturer.



Bin Zhao received the PhD degree from California Institute of Technology. Since 1993, he has been with SEMATECH, Rockwell, Conexant, Sky-

works, Freescale, Fairchild and ON Semiconductor, involved in advanced VLSI technology development and design implementation of analog/mixed-signal/power-management/RF ICs. Currently he is the Director of Southern California Development Center at ON Semiconductor, where he leads IC product development for consumer electronics and mobile wireless solutions. He has authored/co-authored more than 200 journal publications and conference presentations, has written 3 book chapters, and holds 70 issued US patents. He has served as Co-Chair, Technical Working Group of RF and Analog/Mixed-Signal IC Technologies, ITRS; Chair, IEEE Johnson Technology Award Committee; Chair, IEEE Technical Program Integrity Committee; Chair, EDS VLSI Technology and Circuits Committee; EDS Vice President of Conferences; and EDS Vice President of Publications and Products. He is an IEEE Fellow and currently chairing the IEEE Future of Conference IP Committee.

I welcome all electees and urge them to get fully engaged in the affairs of the Electron Devices Society. EDS is considered to be a volunteer-led, volunteer-driven organization, and we expect nothing less from all to continue this tradition.

*Albert Wang
EDS Nominations and Elections Chair
University of California
Riverside, CA, USA*

MESSAGE FROM THE EDS PRESIDENT-ELECT



Fernando Guarin
EDS President-Elect
(2016-2017)

Dear Readers and EDS Members,

It is once again a true honor and privilege to write to you as the EDS President-Elect 2016-2017. I will take this opportunity to share some recent accomplishments and reiterate the many benefits afforded by your membership in EDS. We have continued our path to enhance the value of your EDS membership and to strengthen the case for those who are not members to join in our ranks. First and foremost, EDS is a volunteer-driven and volunteer-run technical society of IEEE. It is therefore critical that our members become engaged if we want our society to flourish while continuing to nurture a lifetime of accomplishments by adding value, technical vitality and fulfillment to our careers. When you become an EDS member you are encouraged to participate and become an integral part of a society with a rich history of accomplishments that have shaped our world and will continue to do so in the years to come. There are many levels of engagement; from contributing the original findings of your research in any of our leading publications, to visiting a local school to enlighten avid young minds with the wonderful accomplishments brought

about by our profession, serving as a role model to motivate them to follow in your footsteps and enabling them to engineer the solutions that will bring about a brighter future. Becoming engaged means active participation in the activities and running of your local chapter. It also means attending and supporting the many invited talks and mini-colloquia offered and funded by EDS in all corners of the world. Participation in one of our webinars that showcase the world's technical leaders in the field of electron devices will afford you the opportunity to learn from the very best and if you happen to miss the live broadcast you can access the recording in the archive residing in the website section available exclusively for our members (<http://eds.ieee.org/webinar-archive.html>).

Let me take this opportunity to provide you with a guided tour through our society's website, so that you may enjoy the many nuggets contained therein. I would suggest that you begin your journey by visiting our main page (<http://eds.ieee.org/>), from there you will have ample opportunity to explore the many sections on; awards, chapters, publications, governance, education, conferences, and our newly created mission fund. I encourage you to visit the Electron Device Letters webpage (<http://eds.ieee.org/edl>), after viewing the main content. I would strongly encourage you to enjoy temporary Open Access to selected "Editors' Picks" papers from the latest

EDL edition—EDL Editors' Picks (<http://eds.ieee.org/edl/edl-editors-picks.html>).

Please also view this newsletter in its online version, so you can take full advantage of the many hyperlinks provided throughout this message: (<http://eds.ieee.org/eds-newsletters.html>). Peruse through the past issues of the newsletter and you will find technical briefs, written by experts in various fields in a comprehensive format to expand your knowledge on all areas of electron devices; overviews of noteworthy papers from IEDM; and reports from our chapters across the globe, to learn about their outreach programs and activities. If your chapter wants to start a mentoring program, we will offer hands-on kits to teach basic electronic circuits, free of charge, through the EDS-ETC mentoring program (<http://eds.ieee.org/the-eds-etc-program.html>). Finally, don't forget to learn more about available awards and scholarships (<http://eds.ieee.org/awards.html>).

I invite you to become an active member of the Electron Devices Society, if you are not a member yet. Visit our website and all the links enclosed in this article, to convince yourself about the added value to your career. I look forward to your feedback on your ideas about how we can improve our society and enhance the value added that a membership to EDS will bring for you.

Fernando Guarin
EDS President-Elect
GlobalFoundries
Hopewell Junction, NY, USA

MESSAGE FROM EDS VICE PRESIDENT OF REGIONS AND CHAPTERS



M.K. Radhakrishnan

Dear EDS Members,

It is an honor for me to write this message as the Electron Devices Society (EDS) Vice President of Regions and Chapters. EDS has a wide spread activity of serving its

members and professionals through the Society Chapters spread around the globe in all the 10 Regions of IEEE. If we look at the EDS Chapters in a nutshell, there are a total of 203 ED Chapters at present, distributed in all continents of the world with 56 ED Society Chapters, 85 Joint Society Chapters and 62 Student Chapters.

EDS has a variety of programs to develop Chapters for the benefit of members. Chapter Subsidy, Distinguished Lectures and Mini-Colloquia are the programs for which EDS provides funding support. Chapters are always encouraged to organize various technical activities like tech talks, seminars, workshops, etc., for its members and humanitarian

activities for the society at large. This year, the Chapter Subsidy Program has been pegged with the activities reported by Chapters in the previous year. This is to encourage Chapters to organize more activities and properly report them officially to the Society. In 2016, EDS Distinguished Lecturers gave more than 120 DL talks at various Chapters in all Regions. Also, there were 20 mini-colloquia organized. All these coupled with various other events and regional conferences organized by Chapters make our EDS Chapters luminous.

However, while reviewing the Chapter activity reports submitted in 2016, it was observed that more than 30% of Chapters are not communicating with EDS. This indicates that either these chapters are inactive or not in the proper communication link. We have initiated a program to revive such weak chapters through our Regions and Chapters (RC) team interaction. The EDS RC team includes the SRC Chairs and vice-chairs of 5 different regions around the globe and the Regions and Chapters committee members. These volunteers are listed on the EDS website. They are serving in every Region to help Chapters in vari-

ous activities. If any of the chapters require guidance and help to develop and organize programs, the Chapter Chair or ExCom members can contact the respective region's RC team members or myself.

Our Student Chapters need a special mention. The student chapters are growing in number in the last few years, much higher than that of regular chapters. However, the total EDS student member strength is not proportionately increasing. This unbalanced growth also results in dormancy or inactiveness of such chapters after few years as the student population moves out of the parent institution. As such, it is highly essential to have strong faculty base as chapter advisors engaged in device research for the sustainability and growth of student chapters. Helping Young Professionals to integrate into the ED Society activities is one of the key initiatives which the Chapters have to focus. Student chapters have a major role to play in this.

Recently, we have streamlined the new chapter approval process and a guideline for the RC team to evaluate an interest group prior to approval has been established. This helps in making the direct contact between RC team

members and the Chapter Chairs at the very initiation itself. Also, we are initiating an EDS on-line chapter reporting form so that all the chapter's activities can be reported to EDS in time. The task before the chapters is not only to serve the members with various activities as and when the opportunities arise, but to also further chapter development with sustainable growth both in member strength and financial stability. This can be achieved by organizing useful and entrepreneurial events for the benefit of professionals at all levels.

All the initiatives and the dedicated efforts by the RC team volunteers as well as the EDS staff are aimed at lifting EDS Chapters to the next level and making them more vibrant. Our motto is *"Healthy and Self-Sustainable Chapters."* I would like to hear suggestions from the members. Our aim is to make the Electron Devices Society a very special one in IEEE through vibrant chapters. Please provide your candid opinion to radhakrishnan@ieee.org.

M. K. Radhakrishnan
EDS Vice President
of Regions and Chapters
radhakrishnan@ieee.org

MESSAGE FROM EDITOR-IN-CHIEF



M.K. Radhakrishnan
Editor-in-Chief
EDS Newsletter

Dear EDS Members and Readers,
It is time for me as Editor-in-Chief (EiC) to bid farewell to all the readers of the EDS Newsletter. I inherited this position as EiC of the EDS Newsletter from Ninoslav Stojadinovic in 2013. In my first message to the readers as EiC I stated that, *"One of my top priorities will be*

to bring the news as fast as possible and to make the Newsletter a unique window for members in line with the Society's mission." I also informed you through this column, that my aim is to revamp the Newsletter as a technical magazine and to have sections for technical articles and society news items in a balanced ratio. So we invited contributors to submit technical articles of relevance and technical highlights from major conferences. Also, we created an entire section for Young Professionals

with their reflections on EDS. Apart from that we have also introduced messages from the EDS President or President-Elect and Vice Presidents in every issue of the Newsletter. Also, the Newsletter has gone from printed to online versions (both available) and accessible to everyone. I am proud to say that these initiatives and the direction towards a technical magazine are the changes made for the first time in the 23-year history of the EDS Newsletter.

It is a team effort and we have a great group of Regional Editors who communicate regularly with Chapters and compile the articles. In the process of releasing every issue of the Newsletter, all these team members helped me without any grouses. We have a key person in the EDS office, Joyce Lombardini, whose relentless work throughout the year keeps the publication process of the Newsletter running smoothly. I would like to take this opportunity to express my personal appreciation and gratitude to all the Regional Editors and Joyce.

If the readers find that a progressive and indispensable pathway has been paved during this period for the EDS Newsletter, the whole credit may go to the entire Newsletter team including the recent past and present Regional Editors and Joyce Lombardini. During the last four years if anything has terribly gone wrong or mistakes have appeared in the Newsletter, it may be my own inadvertent fault and I take the responsibility as the Editor-in-Chief and request exculpation.

I am happy to introduce the new Editor-in-Chief of the EDS Newsletter—Carmen M. Lilley. Carmen is a Young Professional with all the vigor and enthusiasm

to lead this race further. I wish her all the success. It is my pleasure to formally introduce Carmen to the readers.



"Carmen M. Lilley obtained her BS in General Engineering at the University of Illinois at Urbana-Champaign in 1998. She then attended Northwestern University and obtained her PhD in Theoretical and Applied Mechanics in 2003. Upon completing her PhD, she joined the Department of Mechanical and Industrial Engineering at the University of Illinois at Chicago as an Assistant Professor and was promoted to Associate Professor in 2010. Dr. Lilley has published in prestigious journals such as the Applied Physics Letters (APL), Journal of Applied Physics (JAP), and Nano Letters. She served as an Associate Editor for the ASME Journal of Computational and Nonlinear Dynamics from 2011–2015, and has reviewed manuscripts for APL, Journal of Applied Mechanics, JAP, Journal of Vibration and Acoustics, and Nano Letters. She has received various awards

such as the National Science Foundation Faculty Early Career (CAREER) Development Award and the College of Engineering Research Award. Dr. Lilley is a senior member of IEEE. Within EDS, Dr. Lilley is on the IEEE Electron Devices Society Educational Committee (2012–Present), Chair of the MS and PhD Fellowship Committee (2014–Present), and a Board-of-Governors Member-at-Large (2015–Present). She is the technical committee chair on Nanomaterials for the Nanotechnology Council (NTC) (2006–Present) and served as their Council Representative for IEEE Women in Engineering (2012–2016). She has also served on the program committee for the NTC flagship conference, IEEE Nano, as a reviewer, track chair, and was the technical program chair for IEEE Nano 2014."

As the EiC of the EDS Newsletter, I hope I performed my "Karma"—the selfless work without expecting any returns. Thank you all for the love and affection showed during these years. BYE.

M. K. Radhakrishnan
NanoRel LLP

Editor-in Chief, EDS Newsletter
e-mail: radhakrishnan@ieee.org

NEW STAFF JOINS EDS OFFICE

Dear Members,

Two staff members have joined the EDS HQ Office recently.



Ms. Stacy Lehotzky joined EDS on December 5, 2016 as the EDS Committee Administrator. In her new role, Stacy will be primarily responsible

for the overall coordination of the majority of the Executive and Administrative Committees including responsibility for all Governance Meeting Administration and on-site support of the bi-annual Board of Governance meetings, Volunteer Engagement and Committee Administration

which includes the management of the recruitment and appointment process of all ex-officio members, as well as staff lead for member and committee engagement.

Prior to joining EDS, Stacy has over 20 years of IEEE service and has held several positions including the role of Meeting Planner with direct oversight of planning meetings for the IEEE Board of Directors, IEEE Executive Committee, major boards and various standing committees. In addition, Stacy has worked as a Buyer with the Strategic Sourcing Department and her most recent position as the Senior Member Administrator with the Member and Geographic Activities group where her focus was to facilitate the process of Senior

Member applications to increase the visibility and number of Senior Members within IEEE and improve on overall higher grade retention.



Ms. Jessica Lotito, CMP, joined EDS on March 13, 2017 as the Conference/Meeting Project Manager. In this role, Jessica will be responsible for

managing the portfolio (over 50+) of all existing EDS financially sponsored and technically co-sponsored meetings and conferences as well as any new meeting sponsorship requests. Her position at EDS entails working closely with volunteers

to ensure successful conferences. Some of her functions include, conference logistics, contract negotiations, handling of MOUs/budgets, Social Media outreach and other special EDS projects.

Jessica has been with IEEE since 2005 when she joined the Meetings and Events Management (MCE) team working with volunteers planning conferences and meetings for multiple IEEE societies. In September,

2011, Jessica moved over to the Engineering in Medicine & Biology Society (EMBS), where she managed their conference department. Jessica received her A.S. in Travel and Tourism Management in 1998, and her B.S. in Hospitality Management in 2000, both from Johnson & Wales University. Upon graduation, Jessica started off her career in the hotel industry, which gave her an insider's perspective to negotiating contracts

with hotels and program incentives. In January 2009, she earned her Certified Meeting Professional (CMP) designation, a premier industry certification. Since joining IEEE, Jessica has worked on domestic and international conferences with attendance ranging in size from 200 to 10,000 attendees.

Please welcome both of them!

*James Skowrenski
Operations Director, EDS*

EDS VLSI TECHNOLOGY AND CIRCUITS TECHNICAL COMMITTEE REPORT

On December 4, 2016, the EDS VLSI Technology and Circuits Technical Committee (TC) met in San Francisco, California, USA, during the 2016 IEEE International Electron Devices Meeting (IEDM), held December 3–7.

The VLSI Technology and Circuits Technical Committee was formed in 1998 under the leadership of Professor Charles G. Sodini (MIT), followed by Dr. H.-S. Philip Wong (IBM), Werner Weber (Infineon), Dr. James A. Hutchby (SRC), Dr. Bin Zhao (Freescale Semiconductor), and Shu (Shuji) Ikeda (tei Solutions). Since its formation, the VLSI Technology and Circuits TC's mission is to identify new technical trends, help foster new technical concepts, and serve the emerging needs of the Electron Devices and Solid-State Circuits communities in VLSI. The committee members include many well recognized technical experts representing a wide spectrum of technical mastery in VLSI devices, technology, and circuits.

In pursuing the objective of the VLSI Technology and Circuits Committee to identify new and relevant areas of interest to the Electron Devices and Solid-State Circuits communities, the committee recommends any or all of the following based on the nature of the areas:

- 1) Initiate topical workshops of current interest (attached to existing



*Attendees: From left to right – [Standing] Masaaki Niwa, Hitoshi Wakabayashi—[Sitting] Reza Arghavani, Seiichiro Kawamura, Steve Chung, Kazunari Ishimaru, Bin Zhao, and Shuji Ikeda.
Missing from the picture: Min Yang, Kaustav Banerjee, Hiroshi Iwai, and Jacobus Swart*

- conferences or incorporated in new ones)
 - 2) Promote special issues for major publications (e.g., *T-ED*, *J-EDS*)
 - 3) Sponsor panel session topics, invited talks and special sessions for major conferences
- The following topics were discussed during the December 4, 2016 meeting:
- 1) Membership: The committee members were streamlined to a total of 21.
 - a) Membership length was confirmed for two terms of two years each (total of four years).

- b) 2017 committee members are twenty-one, with fifteen member's 2nd term expiring in December of 2017.
- c) The committee's current twenty-one geographically diverse members include:
 - i) North America, eight members (USA: University, Industry, Government)
 - ii) South America, one member (Brazil)
 - iii) Europe, two members (Switzerland, France)
 - iv) Africa, one member (South Africa)

- v) Asia, nine members (Japan, Taiwan, Hong Kong and China)
- 2) Sub-Committee roles and responsibilities of the following subcommittees were discussed:
 - a) Combined Publicity and Conference/Workshops Committee Chair: Reza Arghavani, Lam Research—Discussed promotion of EDTM Conference in March 2017 in Toyama, Japan
 - b) Publication Committee Chair: Min Yang, IBM—Propose special issues for major publications (e.g. *T-ED*, *J-EDS*). Discussed *J-EDS* Special Issue 2017: Selected from EDTM papers
- 3) EDTM—Electron Devices Technology and Manufacturing Conference:
 - February 28 to March 2, 2017 at Toyama International Convention Center <http://ewh.ieee.org/conf/edtm/2017/index.html>.

The Inaugural EDTM—Electron Devices Technology and Manufacturing, a full three-day conference, was held at Toyama International Conference Center, Japan from February 28th to March 2nd, 2017, and fully sponsored by the IEEE Electron Devices Society (EDS). As semiconductor technology scaling challenges continue to grow, the industry must increase collaborative efforts to overcome them. EDTM serves as a forum for the electron devices community to collaborate on topics ranging from devices, materials, and tools, to create new and innovative technologies.

- 4) EDTM—Electron Devices Technology and Manufacturing:
 - a) Focus: Device, Material, and Equipment
 - b) Paper Submission:
 - i) Over 170 submitted papers in the areas of Device, Package, Process, Material, Modeling & Reliability and Emerging Technologies submitted

ii) Plenary Speakers:

- 1) John Pellerin, GlobalFoundries
- 2) Shizuo Tokito, Yamagata University
- 3) Douglas Yu, TSMC
- c) One of two tutorial courses were organized in Japanese. Other tutorials and two short courses were in English.
- d) For detailed information on the EDTM program, please visit the web site: <http://ewh.ieee.org/conf/edtm/2017/index.html>.

Please contact Dr. Reza Arghavani (Reza.Arghavani@lamresearch.com), Conferences/Workshops Subcommittee Chair, or Dr. Shu Ikeda (shu.ikeda@tei-solutions.com), Committee Chair, for further information.

Reza Arghavani
EDS VLSI TC Committee Member
Lam Research Corporation
Fremont, CA, USA

AWARD RECIPIENTS AND CALL FOR NOMINATIONS

2017 IEEE EDS ROBERT BOSCH MICRO AND NANO ELECTRO MECHANICAL SYSTEMS AWARD WINNER

The 2017 IEEE EDS Robert Bosch Micro and Nano Electro Mechanical Systems Award was presented to Professor Clark T.-C. Nguyen, University of California, Berkeley, California, USA, at the 2017 IEEE International MEMS Conference in Las Vegas, Nevada, January, 2017. This prestigious award recognizes and honors advances in the invention, design, and/or fabrication of micro- or nano-electromechanical systems and/or devices.

Clark T.-C. Nguyen (S'90-M'95-SM'01-F'07) received the B. S., M. S., and PhD degrees from the University of California at Berkeley in 1989, 1991, and 1994, respectively; all in Electrical Engineering and Computer Sciences.



Clark T.-C. Nguyen

For pioneering research on high-frequency MEMS vibrating systems and for extraordinary efforts in support of MEMS in industry, government, and teaching

In 1995, Professor Nguyen joined the faculty of the University of Michigan, Ann Arbor, where he was a Professor in the Department of Electrical Engineering and Computer Science up until mid-2006. In 2006, he joined the Department of Electrical Engineering and Computer Sciences at the University of California at Berkeley, where he is presently a Professor and a Co-Director of the Berkeley Sensor & Actuator Center. His research interests focus upon micro-electromechanical systems (MEMS) and include integrated micromechanical signal processors and sensors, merged circuit/micromechanical technologies, optomechanical devices, RF communication architectures, and integrated circuit design and technology. In 2001, Prof. Nguyen founded Discera, Inc., a company aimed at commercializing communication products based upon MEMS technology, with an initial focus on

vibrating micromechanical resonators similar to those pioneered by his research in earlier years. He served as Vice President and Chief Technology Officer (CTO) of Discera until mid-2002 when he joined the Defense Advanced Research Projects Agency (DARPA) where he served for almost four years as the Program Manager of research supported by the Microsystems Technology Office: Micro Power Generation (MPG), Chip-Scale Atomic Clock (CSAC), MEMS Exchange (MX), Harsh Environment Robust Micromechanical Technology (HERMIT), Micro Gas Analyzers (MGA), Radio Isotope Micropower Sources (RIMS), RF MEMS Improvement (RFMIP), Navigation-Grade Integrated Micro Gyroscopes (NGIMG), and Micro Cryogenic Coolers (MCC).

Prof. Nguyen won the IEEE UFFC Cady Award in 2006 and, together with his students, has garnered

more than ten best-paper awards from IEEE conferences and journals focused on frequency control and MEMS. From 2007 to 2009, he served as a Distinguished Lecturer for the IEEE Solid-State Circuits Society. Prof. Nguyen was the Technical Program Chair of the 2010 IEEE Int. Frequency Control Symposium, a Co-General Chair of the 2011 Combined IEEE Int. Frequency Control Symposium and European Frequency and Time Forum, and is presently Co-Chairing the 2017 IEEE Int. Micro Electromechanical Systems Conference. From 2008 to 2013, he served as Vice President of Frequency Control in the IEEE Ultrasonics, Ferroelectrics, and Frequency Control (UFFC) Society, and is currently President of the society.

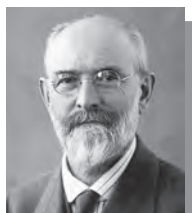
Richard Muller

EDS Bosch Award Chair

*University of California, Berkeley
Berkeley, CA, USA*



IEEE ROBERT BOSCH MICRO AND NANO ELECTRO MECHANICAL SYSTEMS AWARD



*Robert Bosch
(1861–1942)*

*Inventor, Entrepreneur,
Founder of
Robert Bosch GmbH*

The Robert Bosch Micro and Nano Electro Mechanical Systems Award was established by the IEEE Electron Devices Society in 2014 to recognize and honor advances in the invention, design, and/or fabrication

of micro- or nano-electromechanical systems and/or devices. The contributions to be honored by this award should be innovative and useful for practical applications.

This award is sponsored by the IEEE Electron Devices Society with financial support from Robert Bosch LLC. It is intended that the award will be presented annually to an individual or to as many as three individuals whose achievements and contributions are judged to meet the selection criteria for the award. The award will be presented at an IEEE conference of the winner's choice. It is not necessary for the recipient(s) to be a member(s) of IEEE.

The recipient will receive a US\$10,000 honorarium (which includes up to \$3,000 of travel expenses for international travel and \$1,500 of travel expenses for domestic travel), a bronze

medal, and a certificate. In the event that more than one awardee is selected, the cash honorarium will be equally divided among the recipients. Each recipient will receive a bronze medal and a certificate.

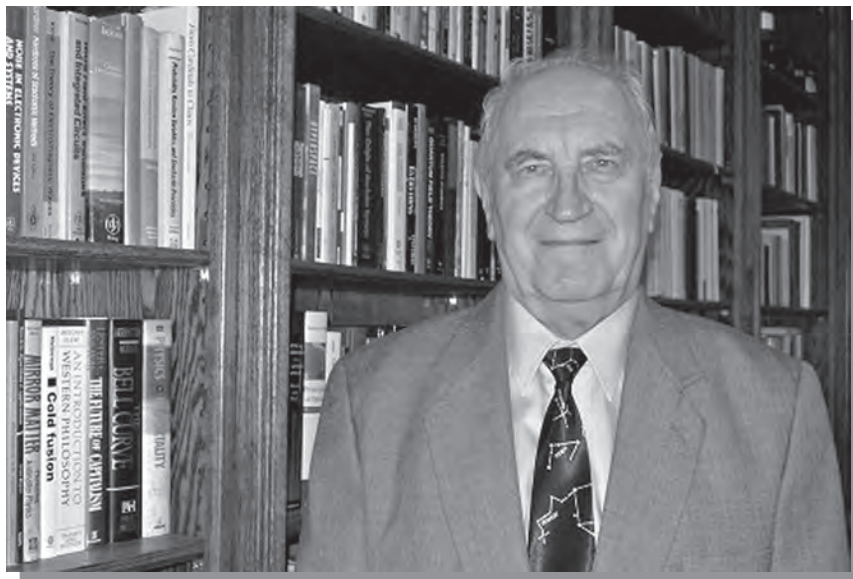
Please visit the EDS website for more information on this award: <http://eds.ieee.org/robert-bosch-micro-and-nano-electro-mechanical-systems-award.html>.

Nominations for this award should be made using our online nomination form and submitted before midnight (EST) on October 2nd. Letters of recommendation must be sent directly to l.riello@ieee.org according to the same schedule.

2016 EDS J.J. EBERS AWARD WINNER

The 2016 J.J. Ebers Award, the prestigious Electron Devices Society award for outstanding technical contributions to electron devices, was presented to Dr. Jaroslav Hynecek of ISETEX, Inc., Allen, Texas, at the IEEE International Electron Devices Meeting in San Francisco, California, on December 5, 2016. This award recognizes Dr. Hynecek "For the pioneering work and advancement of CCD and CMOS image sensor technologies."

Dr. Jaroslav (Jerry) Hynecek (M'73–SM'00) was born in Czechoslovakia, now Czech Republic, on November 26, 1940. He received the Dipl. Ing. degree in electrical engineering from Czech Technical University (CTU), Prague, in 1962. In 1969 he immigrated to the United States and received the PhD degree in electrical engineering from Case Western Reserve University (CWRU), Cleveland, Ohio, in 1974. From 1962 to 1969, he worked at the A. S. Popov Research Institute, Prague, and as an Assistant Professor of physics at CTU, Pobebrady. From 1974 to 1976 he worked at CWRU. In 1976, he joined Texas Instruments Inc., Dallas, and achieved the position of TI Fellow in 1990. In 1998, he founded a consulting corporation, ISETEX, Inc., Allen, Texas, where he is CTO. He has published 56 papers, has 6 conference publications, and is author or co-author of 133 issued US patents. Dr. Hynecek received the Paul Rappaport Award for the best paper published in any IEEE Electron Devices Society journal during 1983, Walter Kosonocky Award in 2003, three NASA Group Achievement Awards, and in 2015 International Image Sensor Society (IISS) Exceptional Lifetime Achievement Award. Dr. Hynecek invented



Dr. Jaroslav Hynecek

Virtual Phase CCD Technology that became the basis for the Pinned Photodiode concept and reduction of dark current by accumulation of holes at the Silicon-Silicon dioxide interface. The TI VPCCD was selected by NASA's Galileo spacecraft on its mission to explore Jupiter. The solid-state imaging subsystem (SSI) camera, based on Jerry's VPCCD invention, enabled significant discoveries in planetary science in the harsh radiation environment of Jupiter's orbit. The surface pinning nature of the invention, the passivated surface traps, suppressed an increase in dark current with operational lifetime. Jerry has also invented the BCMD CMOS image sensor, an early 1-T cell active pixel sensor, widely recognized as an important device by his peers. In 1993, he invented Impactron, also known as EMCCD, a charge multiplying CCD image sensor that is the solid state equivalent

of vacuum tube Image Intensifiers. In this device, small packets of electrons are multiplied using high electric fields during charge transfer. The impact-ionization multiplication effect increases the signal from a few initial electrons to a number well above the noise floor of the CCD and camera, allowing input-referred sub-electron read noise and photon counting. Jerry has also participated in numerous image sensor related conferences and workshops as a member of the paper selection committees or as a session chairman or co-chairman. Dr. Hynecek served as Associate Editor for *IEEE Transactions on Electron Devices* from 1997 until 2006.

*Yuan Taur
EDS J.J. Ebers Award Chair
University of California,
San Diego
San Diego, CA, USA*

IEEE ELECTRON DEVICES SOCIETY J.J. EBERS AWARD

Nominate:

J.J. Ebers Award
on-line nomination form:

<https://ieeeforms.wufoo.com/forms/xl0lxns05xzwir/>

Submission Deadline:

July 1, 2017

Contact:

If you have any questions regarding the EDS J.J. Ebers Award, please contact Laura Riello of the EDS Executive Office at l.riello@ieee.org

Visit:

<http://eds.ieee.org/jj-ebers-award.html>



CALL FOR NOMINATIONS

The IEEE Electron Devices Society invites the submission of nominations for the 2017 J.J. Ebers Award. This award is presented annually by EDS to honor an individual(s) who has made either a single or a series of contributions of recognized scientific, economic, or social significance to the broad field of electron devices. The recipient(s) is awarded a plaque and a check for \$5,000, presented at the IEEE International Electron Devices Meeting (IEDM).



2016 EDS Education Award Winner

The EDS Education Award recognizes an IEEE/EDS Member from an academic, industrial, or government organization with distinguished contributions to education within the fields of interest of the IEEE Electron Devices Society. Dr. Hiroshi Iwai was recognized at the IEEE International Electron Devices Meeting in San Francisco, California, December 5, 2016, as the 2016 EDS Education Award winner. The award cites Dr. Iwai *"For providing high-quality engineering education for industry and academics worldwide."*

Dr. Hiroshi Iwai received the B.E. and PhD degrees in electrical engineering from the University of Tokyo. He worked for the development of semiconductor device technology for 26 years from 1973 to 1999 at Toshiba Corporation and 18 years since 1999 at Tokyo Institute of Technology. He is now a Professor Emeritus at Tokyo Institute of Technology, Japan, a Vice Dean and a Distinguished Chair Professor of National Chiao Tung University, Taiwan. He is an Honorary Professor of the Institute of Microelectronics, Chinese Academy of Science, and the D. J. Gandhi Distinguished Visiting Professor of Indian Institute of Technology, Bombay, and a visiting professor at other universities.

Dr. Iwai has devoted himself, especially to the professional engineering education for more than 40 years. In Toshiba, he helped raise world-top level engineers with many of them receiving PhD degrees while working there. At Tokyo Institute of Technology, he paid a special effort to set up a suitable environment for the education of semiconductor device engineering for students; such as forefront experimental facilities, excellent teaching staff teams from industry and foreign countries, and financial support funds for students.



Dr. Hiroshi Iwai receiving the 2016 EDS Education Award from EDS President, Samar Saha

He educated more than 100 PhD and master students as the main advisor for the past 18 years. He has organized many conferences, workshops, and mini-colloquia to help engineers exchange and discuss the advances in technology. He, himself, also serves as a lecturer providing the professional engineers with the state-of-the-art technology information in short courses and plenary sessions of most of the major semiconductor conferences. He has been an opinion leader for the past 20 years predicting the future of electron device technologies. He wrote many chapters explaining the most advanced technologies for text books.

He has also a passion for education in electron device engineering. He has served as an IEEE EDS Distinguished Lecturer for 22 years, giving a few to several lectures every year for students at many universities and engineering

colleges in the world, including remote areas of Asia, Latin America, and East Europe; as described in every issue of the EDS Newsletter. He initiated the EDS Mini-Colloquium (MQ) Program, in which several EDS Distinguished Lecturers form a team and travel together in the local area. Now, more than 100 MQ's have been held all over the world.

Dr. Iwai is a Life Fellow of IEEE, a member of the Electrochemical Society, a fellow of the Japan Society Applied Physics, and a fellow of the Institute of Electronics, Information and Communication Engineers of Japan. He is coauthored with more than 1,000 international and 500 domestic papers in journals and conferences.

*Meikei leong
2016 EDS Education Award Chair
Hong Kong Applied Science and
Technology Research Institute*



2017 EDS EDUCATION AWARD CALL FOR NOMINATIONS



The IEEE Electron Devices Society invites the submission of nominations for the EDS Education Award. This award is presented annually by EDS to honor an individual who has made distinguished contributions to education within the field of interest of the Electron Devices Society. The recipient is awarded a plaque and a check for \$2,500, presented at the IEEE International Electron Devices Meeting (IEDM).

The nominee must be an EDS member engaged in education in the field of electron devices, holding a present or past affiliation with an academic, industrial, or government organization. Factors for consideration include achievements and recognition in educating and mentoring students in academia or professionals in the industrial

or governmental sectors. Specific accomplishments include effectiveness in the development of innovative education, continuing education programs, authorship of textbooks, presentation of short-courses at EDS sponsored conferences, participation in the EDS Distinguished Lecturer program, and teaching or mentoring awards.

Since this award is solely given for contributions to education, the nomination should exclude emphasis on technical contributions to engineering and physics of electron devices.

Nomination forms can be found on the EDS website: <http://eds.ieee.org/education-award.html>.

The deadline for the submission of nominations for the 2017 award is September 1, 2017.

2016 EDS EARLY CAREER AWARD WINNER

The EDS Early Career Award recognizes young IEEE/EDS members who have made outstanding contributions in an EDS field of interest during the early years of their professional career after graduation.

The 2016 EDS Early Career Award was presented to Nagarajan Raghavan of the SUTD Singapore University of Technology & Design, Singapore, at the EDS Awards Dinner held in conjunction with the IEEE International Electron Devices Meeting in San Francisco, California, on December 4, 2016.

Nagarajan Raghavan is an Assistant Professor at the Singapore University of Technology and Design (SUTD) in the Engineering Product Development pillar. Prior to this, he was a post-doc at the Massachusetts Institute of Technology (MIT) in Boston and at IMEC Belgium, in joint association with Katholieke Universiteit Leuven. He obtained his PhD (Microelectronics, 2012) at the Division of Microelectronics, Nanyang Technological University (NTU),



Presentation of the award to Nagarajan Raghavan (left), by Fernando Guarin, EDS President-Elect (center) and Samar Saha, EDS President (right)

Singapore and S.M. (Advanced Materials for Micro & Nano Systems, 2008) and M.Eng (Materials Science and Engineering, 2008) from National University of Singapore (NUS) and Massachusetts Institute of Technology (MIT), Boston, respectively. His work focuses on statistical characterization and reliability modeling of dielectric breakdown and resistive switching in novel high- κ dielectric material based logic and memory device stacks. His other research interests include random telegraph noise, prognostics and health management, design for reliability and stochastic modeling of nanostructure growth. He is the

Asia-Pacific recipient for the IEEE EDS PhD Student Fellowship in 2011 and the IEEE Reliability Society Graduate Scholarship Awardee in 2008. To date, he has authored/co-authored more than 115 international peer-reviewed publications and four invited book chapters as well. He also holds a US patent as a co-inventor for using CMOS platform to fabricate RRAM devices. He has served on the review committee for various IEEE journals and conferences including IRPS, IIRW, IPFA, ISDRS and ESREF. He is currently a Member of IEEE (2005-present) and was an invited member of the IEEE GOLD committee (2012–2014).

Nagarajan enjoys cycling, traveling, photography and train watching. He is a big rail fan and hopes to continue his adventures traveling on trains all around the world. He loves spending time with young kids and dreams of running a kindergarten of his own in the far future with a unique style of education and enrichment that is inspired by nature and extensive outdoor activities.

*Fernando Guarin
EDS Early Career Award Chair
GlobalFoundries
Hopewell Junction, NY, USA*



2017 IEEE EDS EARLY CAREER AWARD



Description: Awarded annually to an individual to promote, recognize and support Early Career Technical Development within the Electron Devices Society's field of interest.

Prize: An award of US\$1,000, a plaque; and if needed, travel expenses not to exceed US\$1,500 for a recipient residing in the US and not to exceed US\$3,000 for a recipient residing outside the US to attend the award presentation.

Eligibility: Candidate must be an IEEE EDS member and must have received his/her first professional degree within the 10th year defined by the August 15 nomination deadline and has made contributions in an EDS field of interest area. Nominator must be an IEEE EDS member. Previous award winners are ineligible.

Selection/Basis for Judging: The nominator will be required to submit a nomination package comprised of the following:

- The nomination form that is found on the EDS web site, containing such technical information as the nominee's contributions, accomplishments and impact on the profession or economy and a biographical description.

- A minimum of two and a maximum of three letters of recommendation from individuals familiar with the candidate's technical contributions and other credentials, with emphasis on the specific contributions and their impacts.

The basis for judging includes such factors as: the demonstration of field leadership in a specific area; specific technical contribution(s); impact on the profession or economy; originality; breadth; inventive value; publications; honors; and other appropriate achievements.

Schedule: Nominations are due to the EDS Executive Office on August 15th each year. The candidate will be selected by the end of September, with presentation to be made in December.

Presentation: At the EDS Awards Dinner that is held in conjunction with the IEEE International Electron Devices Meeting (IEDM) in December. The recipient will also be recognized at the December EDS Board of Governors Meeting.

Nomination Form: Complete the nomination form by August 15, 2017. All endorsement letters should be sent to l.riello@ieee.org by the deadline.

For more information contact: l.riello@ieee.org or visit: <http://eds.ieee.org/early-career-award.html>.

CONGRATULATIONS TO THE 26 NEWLY ELECTED IEEE ELECTRON DEVICES SOCIETY FELLOWS

EFFECTIVE JANUARY 1, 2017



Paul K.L. Yu
2017 EDS Fellows
Chair

Hugh Barnaby, Arizona State University, Tempe, Arizona, USA
for research of radiation effects in bipolar junction transistors

Yu Cao, Arizona State University, Tempe, Arizona, USA

for development of predictive technology models for reliable circuit and system integration

Edoardo Charbon, Delft University of Technology, Delft, Netherlands
for contributions to solid-state single photon avalanche detectors and their applications in imaging

Wei-ting Chien, SMIC-Semiconductor Mfg. Int'l Corp., Shanghai, China
for leadership in reliability management

Terry Ericson, Ericson Innovations LLC, Annapolis, Maryland, USA
for leadership in power electronics

Christopher Hierold, Swiss Federal Institute of Technology, Zurich, Switzerland
for contributions to microelectromechanical sensors and microthermoelectric energy harvesting

Ru Huang, Peking University, Beijing, China
for contributions to multi-gate silicon nanowire transistor technology

Tian-wei Huang, National Taiwan University, Taipei, Taiwan
for contributions to design and development of millimeter-wave CMOS RFICs

Chia-hong Jan, Intel Corporation, Portland, Oregon, USA

for leadership in developing low power logic technologies for System-on-Chip

Quanxi Jia, University of Buffalo, Buffalo, New York, USA
for contributions to coated superconductors and metal-oxide thin films for electronic applications

Hongrui Jiang, University of Wisconsin, Madison, Wisconsin, USA
for contributions to materials and micro-scale optical tools for medical imaging

Richard King, Arizona State University, Tempe, Arizona, USA
for contributions to high-performance space and terrestrial photovoltaics technology

Hulya Kirkici, Auburn University, Auburn, Alabama, USA
for contributions to high frequency, high field dielectric breakdown and electrical insulation for space and aerospace power systems

Steven Koester, University of Minnesota, Minneapolis, Minnesota, USA
for contributions to group-IV electronic and photonic devices

Xiuling Li, University of Illinois, Champaign, Illinois, USA
for contributions to semiconductor nanomaterials for electronic and photonic applications

Donald Y. Lie, Texas Tech University, Lubbock, Texas, USA
for contributions to high linearity and high efficiency silicon RF power amplifiers for broadband wireless applications

Theresa Mayer, Virginia Tech, Blacksburg, Virginia, USA
for contributions to nanomaterials integration and directed assembly

Junichi Nakamura, Brillnics Japan Inc., Tokyo, Japan

for leadership in CMOS image sensors

Borivoje Nikolic, University of California, Berkeley, California, USA
for contributions to energy-efficient design of digital and mixed-signal circuits

Akihiro Nitayama, Tohoku University, Sendai, Japan
for leadership in 3-dimensional NAND Flash memory technology development

Tomas Palacios, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA
for contributions to gallium nitride electron devices and two-dimensional materials

Dimitrios Peroulis, Purdue University, West Lafayette, Indiana, USA
for contributions to MEMS-based tunable filters

Ramgopal Raovalipe, Indian Institute of Technology, Powai, Mumbai, India
for contributions to CMOS System-on-Chip technologies

Andrei Vladimirescu, Berkeley Wireless Research Center, Berkeley, California, USA
for contributions to the development and commercial adoption of SPICE circuit simulation

Sorin Voinigescu, University of Toronto, Toronto, Ontario, Canada
for contributions to silicon and silicon-germanium microwave and millimeter-wave devices and integrated circuits

Xin Zhang, Boston University, Boston, Massachusetts, USA
for contributions to microelectromechanical systems

Paul K.L. Yu
2017 EDS Fellows Chair
University of California at San Diego
San Diego, CA, USA

EDS MEMBERS RECENTLY ELECTED TO IEEE SENIOR MEMBER GRADE

Ingvar Aberg
Matthias Bauer
Eric Beyne
Gholamreza Chaji
Ta-Ya Chu
Jeff Conger
Songbin Gong
Masahide Goto
Michael Haney

Hadi Heidari
Ali Keshavarzi
Miroslav Micovic
Hidenori Mimura
Bhadra Pokharel
Houria Rezig-Choukri
Choon Beng Sia
Maud Vinet
Doug Weiser



If you have been in professional practice for 10 years, you may be eligible for Senior Membership, the highest grade of membership for which an individual can apply. New senior members receive a wood and bronze plaque and a credit certificate for up to US \$25 for a new IEEE society membership. Upon request a letter will be sent to employers, recognizing this new status. For more

information on senior member status, visit: http://www.ieee.org/membership_services/membership/senior/index.html.

To apply for senior member status, fill out the on-line application after signing in with your IEEE account: https://www.ieee.org/membership_services/membership/senior/application/index.html.

Please remember to designate the Electron Devices Society as your nominating entity!

UPDATES FROM THE 2016 EDS MASTERS STUDENT FELLOWSHIP WINNERS



Carmen Lilley
EDS Student
Fellowship Committee
Chair

The EDS Masters Student Fellowship program is designed to promote, recognize, and support Masters level study and research within the Electron Devices Society's Fields of Interest.

The 2016 EDS Masters Student Fellowship recipients were **Haitong Li** from—Stanford University, California, USA, and **Yi-Pei Tsai** from—National Tsing Hua University, Taiwan. The following are updates on their progress provided by the award winners.



Haitong Li received a B.S. degree in microelectronics from Peking University, Beijing, China, in 2015. He is currently working towards his PhD in Electrical Engineering at Stanford University, supervised by Prof. H.-S. Philip Wong. His current research focuses on brain-inspired in-memory computing with 3D resistive RAM (RRAM). One recent example was demonstrating 3D RRAM-based computing kernels for hyperdimensional computing, which was presented at the 2016 IEDM and selected as one of the highlights by EETimes. He is also serving as a reviewer for *IEEE EDL*, *IEEE*

TED, *Scientific Reports*, *APL*, *IEEE TVLSI*, *IEEE T-CAD*, and *IEEE T-NANO*.



Yi-Pei Tsai is currently a doctoral student at National Tsing Hua University of Taiwan. She has been making progress in her research work on recorders for plasma-induced damage effects in advanced FinFET technologies.

Carmen Lilley
EDS Student Fellowship
Committee Chair
University of Illinois at Chicago
Chicago, IL, USA

UPDATES FROM THE 2016 EDS PhD STUDENT FELLOWSHIP RECIPIENTS



*Carmen Lilley
EDS Student
Fellowship
Committee Chair*

The EDS PhD Student Fellowship Program is designed to promote, recognize, and support graduate level study and research within the Electron Devices Society's Fields of Interest.

The 2016 EDS PhD Student Fellowship recipients were: **Jiahao Kang**—from University of California, Santa Barbara, California, USA, **Hagyoul Bae**—from Korea Advanced Institute of Science & Technology, Rep. of Korea, and **Chao-Yang (Michael) Chen**—from Imec/Katholieke Universiteit, Leuven, Belgium. The following are brief updates on their progress as provided by the award winners.



Jiahao Kang is continuing his research on process and integration of low-dimensional electronic materials. He has successfully demonstrated a novel on-chip inductor technique, which exploits the unique properties of intercalation-doped graphene. The work traverses several expertise domains, from materials physics and nanofabrica-

tion to electromagnetic phenomena, passive device design, and radio-frequency electronics. Recently, he is focusing on exploring energy-efficient logic and memory applications of two-dimensional materials. His contribution in energy-efficient electronics has been recognized by the Peter J. Frenkel Foundation Fellowship Award, which is awarded to only two students per academic year.



Hagyoul Bae is currently working toward a PhD degree at KAIST under the direction of Professor Yang-Kyu Choi. He is continuing his research studies on fabrication and characterization to investigate trap states and contact properties of MoS₂ FETs. Accordingly, he conducted a study for quantitative analysis of intrinsic subgap density-of-states (DOS) and contact resistance in MoS₂ FETs by using a multi-frequency conductance technique. He also developed a novel vertical-type germanium bi-stable resistor (biristor) with a gateless p-n-p (open-base BJT) structure for high density and low voltage memory application. To realize different types of memory, he recently introduced a transient non-volatile memory on a dissolvable paper for security and protection system against unauthorized accessibility,

and he is also studying electronic textile (e-textile) to create a new type of memristive circuit architecture on textile materials by adopting an initiated chemical vapor deposition (i-CVD).



Michael (Chao-Yang) Chen is currently in the last year of his PhD at Imec/KU Lueven working under the direction of Professor Guido Groeseneken and

Dr. Ludovic Goux. Michael is continuing to make progress on resistive random access memory (RRAM), a new type of memory device towards new applications. His most recent output includes the investigation of the origin of different retention failure mechanisms in RRAM and ways to suppress them via programming and material engineering approaches. This work was presented at the 2016 IEEE International Electron Devices Meeting. In addition to reliability studies, he has been working closely with other researchers at Imec to develop new 1S1R RRAM to reduce device footprint. He is expecting to defend his thesis in the summer of 2017.

*Carmen Lilley
EDS Student Fellowship Committee
Chair
University of Illinois at Chicago
Chicago, IL, USA*



2017 Masters Student Fellowship

Description: One-year fellowships will be awarded to promote, recognize, and support graduate Masters level study and research within the Electron Devices Society's field of interest. The field of interest for EDS: all aspects of engineering, physics, theory, experiment and simulation of electron and ion devices involving insulators, metals, organic materials, plasmas, semiconductors, quantum-effect materials, vacuum, and emerging materials. Specific applications of these devices include bioelectronics, biomedical, computation, communications, displays, electro and micro mechanics, imaging, micro actuators, optical, photovoltaics, power, sensors and signal processing.

Three fellowships are expected to be awarded to eligible students in each of the following geographical regions for 2017: Americas, Europe/Mid-East/Africa, and Asia & Pacific. Only one candidate can win per educational institution.

Prize: US\$2,000 and a plaque to the student, to be presented by the Dean or Department head of the student's enrolled graduate program.

Eligibility: Candidate must be an IEEE EDS student member at the time of nomination; be accepted into a graduate program or within the first year of study in a graduate program in an EDS field of interest on a full-time basis; and continue his/her studies at a graduate education institution. The nominator must be an IEEE EDS member and preferably be serving as the candidate's mentor or faculty advisor. Previous award winners are ineligible.

Basis for Judging: Demonstration of his/her significant ability to perform research in the fields of electron devices a proven history of academic excellence in engineering and/or physics involvement in undergraduate research and/or a supervised project.

May 15, 2017 Submission Deadline

Nomination Package

- Nomination letter from an EDS member who served as candidate's mentor or faculty advisor.
- One letter of recommendation from an individual familiar with the student's research and educational credentials. Letters of recommendation cannot be from the nominator.
- One-page biographical sketch of the student (including mailing address and e-mail address).
- Two-page (maximum) statement by the student describing his or her education and research interests, accomplishments and graduation date. This can include undergraduate, graduate and summer internship research work.
- One copy of the student's transcripts/grades. Please provide an explanation of the grading system if different from the A-F format.

Timetable

- Completed nomination packages are due at the EDS Executive Office no later than **May 15, 2017**.
- Recipients will be notified by July 15th.
- Monetary awards will be presented by the Dean or Department Chair of the recipient's graduate program at the beginning of the next academic term.

Please submit application packages via e-mail or mail:

Email: edsfellowship@ieee.org

Mail:
IEEE EDS Executive Office
PhD Student Fellowship Program
445 Hoes Lane
Piscataway, NJ 08854 USA

For more information contact:
edsfellowship@ieee.org

Visit the EDS website:
<http://eds.ieee.org/eds-masters-student-fellowship.html>

WELCOME TO IEEE DATAPORT

IEEE DataPort™ is an easily accessible repository of datasets, including Big Data datasets. IEEE DataPort™ is designed to make storage of datasets easier, provide access to valuable datasets across a broad scope of topics, facilitate analysis of datasets, and retain referenceable data for reproducible research.

[Learn More »](#)



VIDEOSET

A new methodology to measure coded image/video quality using the just-noticeable-difference (JND) idea was proposed in [1]. Several small JND-based image/video quality datasets were released by the Media Communications Lab at the University of Southern California in [2, 3]. In this work, we present an effort to build a large-scale JND-based coded video quality dataset.

GET STARTED

Latest Posts

1 2

For Free Subscriber Access use coupon code:

DATAPORT1

For Free Open Access uploads use coupon code:

OPENACCESS1

IEEE DataPort™ is designed to facilitate the storage, access, and analysis of datasets, as well as to retain referenceable data for reproducible research.

<https://ieee-dataport.org>



Cloud Storage

Store datasets up to 2TB for FREE on Amazon AWS S3 cloud storage. Download datasets or use them with any S3 compatible service "in the cloud".



Ready for Research

All datasets are assigned a DOI (Digital Object Identifier) for use in citations. We also offer Open Access dataset loading to assist with your research funding compliance.



Data Challenges & Competitions

Invite data scientists to analyze your datasets by hosting a Data Competition. Manage access, deadlines, submission, and more.

A project of the IEEE BigData Initiative



About Us

The IEEE Future Directions Big Data Initiative strives to aggregate information about the various endeavors occurring worldwide in order to provide a community of professionals in industry, academia, and government working to solve the challenges associated with Big Data.

Get in touch

Melissa Handa

732-562-2651

melissa.handa@ieee.org



2017 PhD Student Fellowship

Description: One year fellowships will be awarded to promote, recognize, and support PhD level study and research within the Electron Devices Society's field of interest. The field of interest for EDS is all aspects of engineering, physics, theory, experiment and simulation of electron and ion devices involving insulators, metals, organic materials, plasmas, semiconductors, quantum-effect materials, vacuum, and emerging materials. Specific applications of these devices include bioelectronics, biomedical, computation, communications, displays, electro and micro mechanics, imaging, micro actuators, optical, photovoltaics, power, sensors and signal processing.

Three fellowships are expected to be awarded to eligible students in each of the following geographical regions for 2017: Americas, Europe/Middle East/Africa, and Asia & Pacific. Only one candidate can win per educational institution.

Prize: US\$5,000 to the student and if necessary funds are also available to assist in covering travel and accommodation costs for each recipient to attend the EDS Governance meeting in December 2017 for presentation of the award plaque. The EDS Newsletter will feature articles about the EDS PhD Fellows and their work over the course of the next year.

Eligibility: A candidate must be an IEEE EDS student member at the time of nomination; be pursuing a doctorate degree within the EDS field of interest on a full-time basis; and continue his/her studies at the current institution with the same faculty advisor for twelve months after receipt of award. The nominator must be an IEEE EDS member and preferable be serving as the candidate's faculty advisor. Previous award winners are ineligible.

Basis for Judging: Demonstration of his/her significant ability to perform independent research in the fields of electron devices and a proven history of academic excellence.

May 15, 2017 Submission Deadline

Nomination Package

- Nomination letter from an EDS member.
- Two letters of recommendation from individuals familiar with the student's research and educational credentials. Letters of recommendation cannot be from the nominator.
- One-page biographical sketch of the student (including student's mailing address and email address).
- Two-page (maximum) statement by the student describing his or her education and research interests, accomplishments and graduation date.
- One copy of the student's under-graduate and graduate transcripts/grades. Please provide an explanation of the grading system if different from the A-F format.

Timetable

- Completed nomination packages are due at the EDS Executive Office no later than **May 15, 2017**.
- Recipients will be notified by July 15th.
- Monetary awards will be given by August 15th.
- Formal award presentation will take place at the EDS Governance Meeting in December.

Please submit application packages via e-mail or mail:

Email: edsfellowship@ieee.org

Mail:
IEEE EDS Executive Office
PhD Student Fellowship Program
445 Hoes Lane
Piscataway, NJ 08854 USA

For more information contact:
edsfellowship@ieee.org

Visit the EDS website:
<http://eds.ieee.org/eds-phd-student-fellowship.html>



The IEEE Electron Devices Society is a vibrant, prolific organization whose members make vital contributions to the global technical community each year. To ensure that our members' work is properly recognized, we encourage you to nominate fellow members for our annual awards. It is in this vein that we would like to draw your attention to the awards listed to the right.

These highly prestigious awards draw nominations from all over the world. Please visit the [EDS awards website](#). You can find important information about eligibility, deadlines and other details. If you need more information or have a question about preparing a nomination, please contact Laura Riello of the EDS Executive Office, l.riello@ieee.org. We strive to maintain a comprehensive set of awards that reflect our member activities. As the field of electron devices evolves, so to must our awards. If you would like to suggest new awards, we would welcome your comments and suggestions.

Sincerely,
Albert Wang
EDS Awards Committee Chair



Jaroslav Hynecek, 2016
IEEE EDS J.J. Ebers Award
winner

[Robert Bosch Award](#)
[J.J. Ebers Award](#)
[Distinguished Service Award](#)
[Education Award](#)
[Early Career Award](#)
[PhD Student Fellowship](#)
[Masters Student Fellowship](#)
[Chapter of the Year Award](#)

**Visit the EDS
Website**

YOUNG PROFESSIONALS

'SMART' DRIP-IRRIGATION SYSTEM DEVELOPED BY TEAM OF UNIVERSITY OF HOUSTON STUDENTS

By ADDY RUCOBA

Four University of Houston capstone students, Adilene Rucoba, Albert Truong, Joseph Pompa and Carlos Quiroga, worked to develop and implement a 'smart' irrigation system as a research and design tool in Central America. The 'Smart' Drip-Irrigation is a microcontroller-based system installed in a 66 [ft] x 16.5 [ft] greenhouse within campus grounds of the National Agrarian University (UNA) in Managua, Nicaragua. Managua is part of the country's "dry corridor" region which experiences a much harsher dry season in comparison to the rest of the country. Maximizing water supply is critical, and one of the University of Houston (UH) team's main objectives.

The UH team worked alongside National University of Engineering (UNI) student, Miguel Escorcia Rojas, to meet specifications requested by the project manager and UNA professor, Dr. Henry Duarte. The 'Smart' Drip-Irrigation System provides UNA professors and stu-



University of Houston students' first visit to Nicaragua for site selection

dents with environmental data to be utilized for research and analysis of crop-growing practices. At the same time the installed system fulfills UH team's agenda of optimizing water supply, and testing the equipment against time and climate for the future development of a small-scale

system for farming families in the "dry corridor" region of Nicaragua.

The 'Smart' Drip-Irrigation System uses sensors to regulate relative air humidity, air temperature, and soil moisture through control valves. The sensors also allow the user to monitor their data and experiment by making



The 'Smart' Drip-Irrigation system installed at a greenhouse in Managua, Nicaragua

adjustments to control valve thresholds. The system, installed early November 2016, offers historical data uploaded to an on-site SD card and is powered by a photovoltaic system.

The University of Houston team hopes to aid future UH capstone teams in the continued development of The 'Smart' Drip-Irrigation System and transform it into a product which is robust and accessible to small-scale farmers in Nicaragua for the purpose of conserving water and feeding families.

"This is exactly the kind of project that IEEE is encouraging and which it has articulated in its mission to 'foster technological innovation and excellence for the benefit of humanity'" says Dr. Doug Verret, IEEE Life Fellow. "It is the reason that the Electron



Students installing irrigation lines at greenhouse in Managua, Nicaragua

Devices Society contributed hardware to the project and that the Texas Instruments Foundation awarded grants to this team of young engineers. It is also responsive to several of the Grand Challenges issued by the National Engineering Academy. It is heartening and quite gratifying to see the next generation of electrical engineers choosing an outreach project that leverages technology for betterment of a group of people struggling to feed themselves and their families. It is reason to be optimistic for the future and critically important in these times for technology to expand and tackle global issues when countries are trending toward isolationism and nationalism. I could not be more proud of this team."

EDS LAUNCHES A SERIES OF EXPLORATION CAMPS IN REGION 10 TO CULTIVATE FUTURE ELECTRONIC ENGINEERS

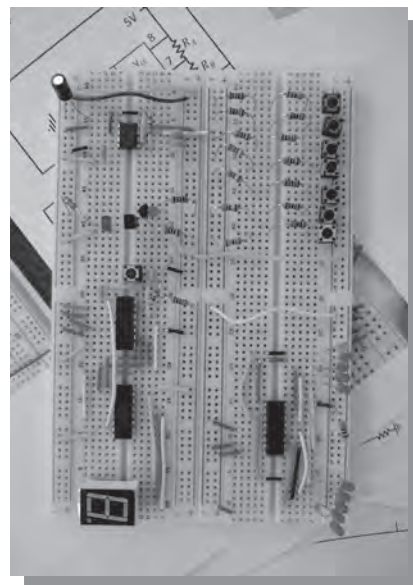
BY MANSUN J. CHAN, EDS CHAIR OF EDUCATIONAL ACTIVITIES

In order to support the need for STEM (Science, Technology, Engineering and Mathematics) education to foster young engineers for sustainable technology advancement, the IEEE Electron Devices Society launched a series of Electronic Exploration Camps for primary and secondary school students in Hong Kong, Shenzhen and Beijing. The camps are organized as 3 full-day workshops, together with games, team building and sharing sessions. The content and format was adopted from the Electronic Winter Camp developed by the ED/SSC Hong Kong Chapter and the Hong Kong University of Science and Technology, which has become an annual event since 2012. In the camp, students ranging from 10 to 15 years old were given the opportunity to experience the fun of electronic designs. The instructors and student helpers are all Undergraduate Electronic Engineering

students. In the camps, the young children constructed various electronic gadgets such as a running light, an electronic piano, and infrared transmitter/receiver and digital counter on breadboards with generic components. In addition to stimulating the interest of young children to electronic design, the camps also provided an opportunity for the university students to practice their presentation and organization skills.

Electronic Exploration Camp in Hong Kong

Similar to the previous year, the ED/SSC Hong Kong Chapter and the Hong Kong University of Science and Technology co-organized a 3-day winter camp under the new brand, IEEE Electronic Exploration Camp, December 28–30, 2016. It was the 5th time the camp was organized at the beautiful campus of the Hong Kong University



A circuit constructed by a student during the Exploration Camp

of Science and Technology. There were more than 90 attendees joining the camp, with the support of more than 20 volunteers acting



2016 IEEE Electronic Exploration Camp participants at the Hong Kong University of Science and Technology



Students constructing their circuits during the Electronic Winter Camp

Electronic Exploration Camp in Shenzhen, China

The first IEEE Electronic Exploration Camp in Shenzhen, China, was launched on January 16–18, 2017, at Shenzhen University by the ED/SSC Beijing Section Shenzhen Chapter in collaboration with Shenzhen University and the Peking University Shenzhen Graduate School. There were about 20 students who joined the 3-day camp and constructed a DIY running light, an electronic piano, infra-red detector and digital counter with the help of 8 volunteers. The camp has successfully stimulated the interest of the participants on electronic technology and cultivated their problem-solving ability. This is the first time such an activity is being launched in China and we are in a learning phase. We expect to host a larger scale electronic camp in the near future. Visit the website for the IEEE Electronic Exploration Camp in Shenzhen, at <http://elex.ust.hk/sz2017/en/>.

Xinnan Lin
ED/SSC Beijing Section
Shenzhen Chapter Chair

as student helpers. The participants were very excited about the projects introduced at camp and asked a lot of questions, resulting in many lively discussions. The parents were also surprised by the achievement of their children

when they brought the finished project home and shared their experience. The camp has successfully aroused the interest of students to electronic engineering and everyone enjoyed the camp with lots of laughter.



2017 IEEE Electronic Exploration Camp participants at Shenzhen University



Students constructing their circuits during the Electronic Exploration Camp



A volunteer helping students to construct their circuits during the Electronic Exploration Camp



2017 IEEE Electronic Exploration Camp participants at Beijing University of Technology

Electronic Exploration Camp in Beijing, China

A very small scale 3-day IEEE Electronic Exploration Camp was launched in Beijing, China, on January 16–18, 2017, at Beijing University of Technology, with the support of the ED/SSC Beijing Section Shenzhen Chapter. The camp was led by Shuchuan Wang, a student volunteer with the help of Prof. Shengqi Yang of Beijing University of Technology. The camp was attended by about 10 people of mixed ages including visitors from Africa. None of the attendees had prior knowledge of electronic circuits. The small scale of the event enabled participants to do more in-depth exploration of the projects and many of them were able to construct new applications with the modules covered in the camp. All participants are excited to learn the magnificent world of electronics and have already volunteered to be helpers when future exploration camps are organized.

*Mansun Chan
Education Committee Chair
IEEE Electron Devices Society*

CHAPTER NEWS

MQs, DLs AND CONFERENCE REPORTS

IEEE MEMORY DAY

By JOHN ZHANG

On November 3, 2016, IEEE Electron Devices Society Northern Virginia/Washington D.C. Chapter hosted a unique Memory Day Event at Micron Technology's Manassas facility in Northern Virginia. This event consisted of five talks, focusing on the History of Semiconductor Memory, Current Landscape of Memory Industry, Future Emerging Memory, and Space Radiation Effect in Memory Devices. The event ended with a tour of Micron's Memory Fab.

The event started with an introduction and welcome by Mr. Thomas Joseph, the Director of Process and Equipment Engineering, Micron Technology Virginia. Then Mr. Dinu Patel gave an overview about the history of DRAM with one transistor and one capacitor cell structure, invented by Robert Dennard at IBM in 1967. His talk juxtaposed the DRAM history with that of the Manassas memory Fab over the last four decades with a number of anecdotes, which made the audience laugh.

Dr. John Zhang from Micron Technology gave a talk about the current landscape of semiconductor memory industry, focusing on global memory manufacturing facilities, global sales revenue and market shares, current technology trends and future roadmap. He started with memory classifications and basic memory cell structures and compared the device performance for different memory devices. He also discussed the top 5 global memory producers for their product portfolio, their competitive advantages and future technology roadmaps to emerging memory.



Invited speakers (left to right), John Zhang, Rashmi Jha, Nadim Haddad, Dinu Patel and David Nminibapiel

Dr. Rashmi Jha from the University of Cincinnati gave a talk about emerging memory: Resistive Random Access Memory (ReRAM)—Opportunities and Challenges. She discussed various types of transition metal oxide (TMO) based ReRAM devices, device physics behind switching and charge transport in various resistive states, device performance, and pending challenges to be addressed to achieve the desired device targets. The applications of these devices in low-energy digital and hardware-enabled neuromorphic computing were also presented. Dr. Jha's talk brought a lot of interest in emerging memory from the audience.

Mr. Nadim Haddad gave a talk about radiation and its effects on memory devices. He reviewed operational environments, the effect of various radiation sources on device operation and reliability, and approaches to mitigate radiation effects. He also discussed the effects of technology scaling, and unique mechanisms affecting scaled devices that were negligible in older technologies. His talk sparked a lot of curiosity about the space application of electronic devices.

During lunch, David Nminibapiel, a PhD student from National Institute of Standards and Technology and Old Dominion University, showcased his PhD research work about an interesting

approach to resistance tuning in RRAM. He discussed a compliance-free pico-second smart pulse programming for RRAM, which could provide practical application in the Resistive RAM development. His research work also caught the attention of memory technologists from Micron Technology.

After the presentations, we hosted a Fab window tour to allow participants to experience the state-of-the-art semiconductor facility of Micron Technology Memory Fab and interact with Micron engineers. This event provided a unique opportunity for college students and anyone who has never been to a semiconductor Fab before to learn the advanced semiconductor manufacturing facility/processes.

The audience came from local companies, colleges and governmental organizations in Washington



During event at Micron Technology's Manassas facility

D.C., Northern Virginia and Maryland regions and the turnout was high for both IEEE member and non-IEEE member. They were glad to have this

learning event and responded with very positive feedback.

~ Mukta Farooq, Editor

INAUGURAL IEEE INTERNATIONAL MICROWAVE, ELECTRON DEVICES, SOLID-STATE CIRCUITS SYMPOSIUM (IMESS) 2016—PENANG, MALAYSIA

By WONG PENG WAN

The inaugural International Microwave, Electron Devices, Solid-State Circuits Symposium (IMESS) 2016, with the theme of "An Avenue to Explore IoT and 5G," was successfully held on November 9–10, 2016, at Penang Skills Development Center, Penang, Malaysia. IMESS is co-organized by the ED/MTT/SSC Penang Chapter (IEEE Penang) and PSDC. IMESS successfully attracted a crowd of 210 engineers and researchers from Malaysia and overseas. IMESS is a free-of-charge event with strong support by society sponsors, industry sponsors, committee members and the Universiti Sains Malaysia IEEE Student Branch. The objective of IMESS is to provide a forum for technical topics related to microwave, electron devices and



Top Left: Presentation of souvenir by Dr. Wong Peng Wan to State Chief Minister, Top Right and Bottom: Chief Minister visiting exhibition booths, Bottom Right: Press Conference at VIP Room



Participants of IMESS 2016



Top Left: Talk by Dr. Arokia Nathan, Top Right: Talk by Mr. Sivaraman, Bottom Left: Delegates visiting exhibition, and Bottom Right: Presentation of certificate to Dr. Bo Yu Zheng by Dr. Jaga Rajendran

consisted of seminars on November 9th and the first half of November 10th, followed by a student technical visit to Intel on the second half of the day. Society sponsors were IEEE Region 10, EDS, MTT-S, SSC, The Institution of Engineers Malaysia (IEM), PSDC and Invest-in-Penang Berhad. Besides the seminars, there

was also an exhibition of product and technology solutions by industry sponsors.

IMESS 2016 began with welcoming speeches by the CEO of PSDC, Mr. Muhamed Ali Bin Hajah Mydin and Dr. Wong Peng Wen at PSDC Auditorium. After that, the Penang State Chief Minister, Honourable

Tuan Lim Guan Eng officiated IMESS 2016. In his opening speech, Tuan Lim Guan Eng shared the initiatives by the State Government to reinforce Penang's position as an electrical and electronic manufacturing hub and establish itself as the center of excellence for science and technology. After the opening speech, Dr. Wong presented a souvenir to the Chief Minister accompanied by the VIPs, EDS Vice President of Regions and Chapters, Dr. M. K. Radhakrishnan; IMESS Vice Chair Dr. Jamuar, PSDC; CEO Mr. Muhamed Ali; Diamond Sponsors Mr. Alan Seah and Mr. Fong Hong Kee; followed by a visit to the exhibition where the Chief Minister was impressed with the technology demonstrated. After that, a press conference was held in the VIP room before the commencement of the symposium. The symposium commenced with plenary talks by Mr. Alan Seah, Managing Director of Rohde & Schwarz, Malaysia, chaired by Mr. Anwar Faizd Osman. On November 10th, the symposium began with a keynote talk by Mr. Fong Hong Kee, Education and Medical Technology Marketing Manager of Keysight Technologies, Malaysia.

A total of 23 invited speakers from industry and academia delivered their talks under parallel ED/MTT/SSC tracks. Among the speakers, 14 were from industry and 9 from academia. Each one-hour talk included a Q & A session. After the last seminar, IMESS 2016 Vice Chair Dr. Sudhanshu Shekhar Jamuar, delivered his closing speech and expressed gratitude to all sponsors, delegates and committee members for making IMESS 2016 a success and look forward to IMESS 2017. The event was also coupled with a free technical tour hosted by Intel and designed particularly for students, as we recognize the importance of promoting science and engineering.

~ Sushitha Menon, Editor

EDS MINI-COLLOQUIUM HELD AT PONTIFICIA UNIVERSIDAD JAVERIANA-BOGOTA, COLOMBIA

By G. YAMHURE

A meeting of the ED Colombia chapters was held on November 15, 2016, at the Pontificia Universidad Javeriana in Bogota, attended by EDS members, representing most of the country's chapters. In conjunction with the chapter's meeting, an EDS mini-colloquium was organized with the participation of Distinguished Lecturers from industry and academia, like EDS President-Elect, Dr. Fernando Guarín; Professor Paul R. Berger from Ohio, Founder/Director of the Nanoelectronics and Optoelectronics Laboratory (NOEL) and Polymer Device Laboratory (PDL); EDS Young Professionals Committee Chair, Daniel Camacho Montejo from Intel Corporation; Dr. Stewart Rauch, Principal Member of Technical Staff at GlobalFoundries; and from INAOE Mexico, Professor Edmundo Gutiérrez Domínguez.

The following distinguished lectures were presented:

- *"Leveraging semiconductor technology for the benefit of society,"* Dr. Fernando Guarín, *Global-Foundries, USA*
- *"Terrestrial Radiation Induced Soft Errors in Integrated Circuits,"*

Dr. Stewart Rauch, *GlobalFoundries, USA*

- *"The social impact of research and technology development in electronic devices."* Prof. Dr. Edmundo Gutiérrez, *INAOE, Mexico*
- *"Conjugated Polymer-based Flexible Electronics, Foldable Optoelectronics and Photovoltaics,"* Dr. Paul R. Berger, *NOEL and PDL, USA*
- *"Architecture, components and Operation of Digital PLLs In nanometric CMOS technologies,"* Daniel Camacho Montejo, *Intel, USA*

The event was attended by professional and student EDS members, as well as non-members. Many students, who in addition to enjoying the lectures, became aware of the advantages of belonging to IEEE and particularly to EDS.

The new chapter from the Universidad Industrial de Santander (UIS) had the opportunity to run a demo of their newly designed open source RISC V microcontroller. The Colombian EDS chapters jointly decided to work towards the utilization of the

controllers for the education of children and promotion of their understanding of technology, which will be utilized in the Engineers Demonstrating Science: an Engineer Teacher Connection or EDS-ETC program.

Additional details about the new microcontroller have been published in several venues:

- EETIMES:
http://www.eetimes.com/author.asp?section_id=36&doc_id=1330445
- Microcontroller featured at Hackaday:
<http://hackaday.com/2016/10/10/the-journey-toward-a-completely-open-microcontroller/>
- Microcontroller featured at EETIMES Europe:
<http://www.electronics-eetimes.com/news/risc-v-mcu-grown-colombia/page/0/1>
- IEEE LASCAS 2016:
<https://github.com/onchipuis/mriscv/blob/master/PID4063257.pdf>

~Joao Antonio Martino, Editor



Attendees at Mini-Colloquium in Bogota, Colombia, November 15, 2016

EDS DISTINGUISHED LECTURE AT ED JAPAN CHAPTER

By MASAAKI NIWA AND TAKAHIRO SHINADA

The ED Japan Chapter (Chair: Masaaki Niwa) hosted an EDS Distinguished Lecture on December 22nd, Sendai, Japan, co-hosted with Center for Innovative Integrated Electronic Systems (Director: Tetsuo Endoh), Tohoku University. Prof. Bin Yu, IEEE Fellow, State University of New York, talked about "Future Devices Enabled by 2D Nanomaterials," in which emerging 2D material platforms including logic, memory, and other applications were introduced after the comprehensive review of 2D materials. After his talk, the challenges and near-future opportunities were discussed with the attendees.

~ Kuniyuki Kakushima, Editor



Prof. Bin Yu, State University of New York, and attendees of the IEEE EDS Distinguished Lecture held at Tohoku University in Sendai, Japan, on December 22, 2016. Group photo: (front row from left) Prof. Tetsuo Endoh (Director of Center for Innovative Integrated Electronic Systems), Prof. Bin Yu (Distinguished Lecturer, IEEE Fellow), and Prof. Masaaki Niwa (Chair of ED Japan Chapter)

IMPORTANT INFORMATION WHEN PLANNING YOUR NEXT EDS CHAPTER EVENT

Dear EDS Chapters:

When planning your upcoming chapter meetings, workshops, etc., please remember to visit the EDS website for a recent list of EDS Distinguished Lecturers and lecture topics.

✓ Checklist

- Chapter contacts EDS DL to check availability, confirms date/location of lecture, discusses DL

funding needs and determines chapter funding

- EDS DL completes EDS DL Activity Log and Funding Request Form
- If applicable, obtain EDS funding approval
- Chapter publicizes lecture via web, email, etc. Obtain a chapter member list via SAMIEEE (<http://www.ieee.org/about/volunteers/samieee/index>)

- If applicable, DL submits an IEEE expense report to Laura Riello, to receive reimbursement
- Chapter Chair/DL Coordinator submits an EDS DL/MQ Feedback Form

If you have any questions and/or need more information, please do not hesitate to contact Laura Riello, EDS Executive Office.

Thank you for your continued support of the Society.

EDS MINI-COLLOQUIUM HELD AT SANTO TOMÁS UNIVERSITY-TUNJA, COLOMBIA

By RICARDO CASALLAS

The Faculty of Electronic Engineering Department of Santo Tomás University, along with the Student Branch and the IEEE ED USTA Tunja Professional and Student Chapter, held the "Second International Symposium on Engineering and Development of New Technologies, MQ IEE/EDS 2016," in the City of Tunja, Colombia, on November 10 and 11, 2016. The event was held at the facilities of the University of Santo Tomás.

Lectures were delivered by four EDS Distinguished Lecturers: Fernando Guarín, PhD, IEEE Fellow EDS President Elect 2016–2017; Stewart Rauch, PhD, EDS DL; Edmundo Gutiérrez, PhD IEEE Senior, EDS DL; Jacobus Swart, PhD, IEEE Fellow; along with Daniel Camacho, MSc, Chairman of the Young Professionals Committee of EDS. During the event, the 2015 EDS Region 9 Chapter of the Year Award to ED Santo Tomas University (Tunja, Colombia)

Student Branch Chapter, was presented by Dr. Fernando Guarín to the Chapter President, Vivianne Niño. She was accompanied by The Rector of the University, Fray Jorge Ferdinando Rodríguez Ruiz, OP.

The purpose of the International Symposium on Engineering and Development of New Technologies was to promote the exchange of academic and research experiences in Electronic Engineering and related areas, in the fields of electronic devices, sensors and automation. In addition, new links were created and the scope of the relationship between the faculty and EDS was expanded; visualizing in the short term the development of projects that will benefit the region, especially to communities with sensitive energy and sustainable management needs of water conservation and management.

The following lectures were presented:

- "Leveraging semiconductor technology for the benefit of society," Dr. Fernando Guarín, GlobalFoundries, USA
- "Terrestrial Radiation Induced Soft Errors in Integrated Circuits," Dr. Stewart Rauch, GlobalFoundries, USA
- "The social impact of research and technology development in electronic devices," Prof. Dr. Edmundo Gutiérrez, INAOE, Mexico
- Innovation by ASIC design and emerging sub-stream markets Prof. Dr. Jacobus Swart, IMEC, Belgium and UNICAMP, Brazil.
- "Architecture, components and Operation of Digital PLLs In nanometric CMOS technologies," Daniel Camacho Montejó, Intel, USA.

~Joao Antonio Martino, Editor



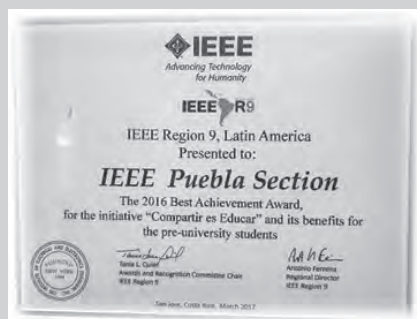
EDS MQ in Tunja, Colombia, November 10–11, 2016

IEEE PUEBLA SECTION AWARDED THE IEEE 2016 BEST ACHIEVEMENT AWARD

"Sharing is Educating" is an initiative driven by the IEEE Puebla Section, with a strong participation of students, Women in Engineering, IEEE SIGHT, EDS, and other societies.

In recognition of that teamwork, collaboration and high societal impact, IEEE Region 9 (Latin America) awarded the IEEE Puebla Section with the **2016 Best Achievement Award**.

Edmundo A. Gutierrez D., of IN-AOE, Puebla, Mexico, sent a spe-



cial thank you to EDS President-Elect, Fernando Guarin. *"The Snap*

Circuits kits you provided for this initiative have strengthened the program, and thanks to those donations more than 1,200 children were trained and attended in the year 2016.

On behalf of my IEEE mates, colleagues, friends, students, and particularly Alejandro Díaz M., and Patricia Guzman, we thank you for your support."

Regards, Edmundo

YOUR CHAPTER COULD BE MISSING IMPORTANT NOTICES AND FUNDING OPPORTUNITIES!

Please remember, whenever there is a change to Chapter Officers, both IEEE and EDS must be notified. Please follow these two steps:

- 1) Report officer changes to IEEE via the vTools Officer Reporting form: <https://officers.vtools.ieee.org/> (access to vTools requires use of an IEEE account).
- 2) Report officer changes to EDS by completing the Chapter Chair Update Form: <https://ieeeforms.wufoo.com/forms/pgu6n1i1ixepnu/>

Thank you in advance for your assistance.

REGIONAL NEWS

USA, CANADA & LATIN AMERICA (REGIONS 1-6, 7 & 9)

ED/CAS Venezuela Chapter

—by A. Ortiz-Conde

Luis Salvador Hernández visited our chapter, at Simón Bolívar University, Caracas, on Tuesday, October 4, 2016, in order to present to us the different possibilities for online teaching and learning. Luis Salvador is presently the commercial director of Desire to Learn (www.d2l.com), which

is dedicated to developing virtual education.

There was a very lively involvement of the audience in discussions and the many interesting questions and answers motivated the beginning of a collaboration project in this area.

For additional information, contact Professor Adelmo Ortiz-Conde at ortizc@ieee.org.

ED Mexico Chapter

—by Arturo Escobosa

In order to exchange opinions, plan activities and define common strategies, a Mexican Chapters meeting was organized in Boca del Rio, a

town in the area of the Port of Veracruz, Mexico. The meeting was held on October 7, 2016, and was hosted by the local Universidad Veracruzana Student Branch Chapter at the Microna facilities.

There were 20 attendees, including the chairs and advisors of the chapters from: México City, Puebla, Cinvestav, Universidad de Puebla, Universidad Veracruzana and Instituto Tecnológico de Morelia.

The participants were informed about the topics discussed at the EDS BoG meetings, specifically those concerning the Chapters and Regions Committee. The chapters reported their most relevant activities. Since all EDS chapters in Mexico are associated with academic institutions, the participants also reported the main fields of interest of their working centers, in order to explore collaboration among the different groups.

Worth to mention is the success of the EDS-ETC program. In Puebla it has found a social meaning supporting poor communities and developing an interest in electronics by children that otherwise would not have an interest in studying. This aggregation could set the



(right to left), Luis Salvador Hernández, María Isabel Giménez, Gerardo Fernández, Andrea Sucre and Víctor Guzmán



Mexican Chapters Meeting on October 7, 2016

basis for a reproducible model in these kind of communities. In Morrelia this program has been implemented to assist the local museum activities. In both cases, the participation of chapter members has been crucial.

EDS membership has also been useful in order to increase collaboration among different groups, not only in the country, but throughout the world. The participants expressed concern about increasing membership and several strategies were discussed in order to improve it.

ED South Brazil Chapter University of Sao Paulo, Brazil —by Joao Antonio Martino

The Polytechnic School of University of Sao Paulo and ED South Brazil Chapter organized the annual Hands on Microfabrication of SOI nMOSFET, free of charge, for educational application. This is the only SOI microfabrication course in Latin America.

The graduate and undergraduate students were selected from different universities and research centers of Brazil, and had an opportunity to



The organizers: Joao Martino, Marcelo Carreno and Ricardo Rangel, from University of Sao Paulo and the students of the 2016 microfabrication class

design the main step process parameters, to perform the microfabrication (clean room) and the electrical characterization of the SOI nMOSFET fabricated during the course.

This hands-on microfabrication was held at the University of Sao Paulo on July 25–29, 2016, (40 hours) resulting in a self-aligned polysilicon-gate Fully Depleted SOI nMOSFET.

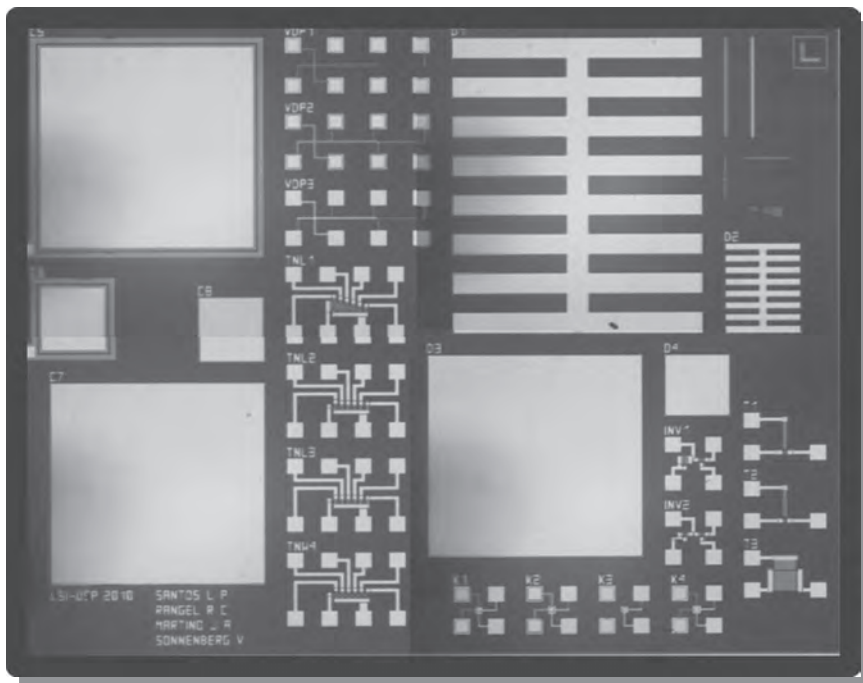
This course was opened for everyone in IEEE Region 9, free of charge. The only limitation is due to the clean room facilities, allowing only 12 students per course.

For additional information, contact Prof. Joao Antonio Martino (martino@lsi.usp.br) or Prof. Marcelo Carreno (carreno@lme.usp.br).

ED South Brazil Chapter —by Paula Agopianr

The Laboratory of Integrated System (LSI) of Electronic System Department (PSI) of University of Sao Paulo (USP, Brazil), the Sao Paulo State University (UNESP), Campus of Sao Joao da Boa Vista, Brazil) and the Electron Devices South Brazil Chapter, organized the annual **Hands-on Electrical Characterization of Advanced Transistors**, free of charge, at University of Sao Paulo for educational and research applications.

The graduate and undergraduate students had an opportunity to understand (theoretically and experimentally), the main transistor milestones starting with MOSFET and continuing with SOI MOSFET, UTBB SOI, FinFET and finally Tunnel-FET. After a theoretical introduction of each device, the participants had an opportunity



Microchip fabricated at University of Sao Paulo (USP) by the students during the Hands-on Microfabrication of SOI nMOSFET in 2016

EUROPE, MIDDLE EAST & AFRICA (REGION 8)

AP/MTT/ED/AES/GRS/NPS/ EMB East Ukraine Chapter

The Chapter organized the 16th International Conference on Electromagnetic Theory (MMET-2016), which was held on July 5–7, 2016, at Ivan Franko Lviv National University. MMET-2016 was co-organized by: Ivan Franko Lviv National University, O.Y. Usikov Institute of Radiophysics and Electronics NASU, G.V. Karpenko Institute of Physics and Mechanics NASU, IEEE Central Ukraine (Kyiv) SP/AES Societies Joint Chapter, IEEE Ukraine PHO Society Chapter, IEEE West Ukraine AP/ED/MTT/CPMT/SSC Joint Chapter, and IEEE IRE NASU Kharkiv Student Branch. The Conference organization was supported among others by IEEE.

The technical sessions of the conference comprised a broad range of topics related to the electromagnetic field theory, modeling and applications, e.g.: lenses, radars, antennas, waveguides, photonic devices, wave/beam propagation, mathematical modeling, numerical methods. Twenty-four invited talks and approximately 80 regular talks were given during the conference.

The conference technical part was accompanied by an interesting social program including a sightseeing of the picturesque City of Lviv, as well as receptions in the historical buildings.

The conference website: <http://www.mmet.org/2016/index.php>.

ED/MTT/CPMT/SSC/COM Central Ukraine Chapter –by Yuriy Poptavko

The Chapter is involved in organization of two important events.

A financial and technical co-sponsorship will be provided for the IEEE 37th International Conference on Electronics and Nanotechnology (ELNANO-2017),



Electrical characterization room at University of Sao Paulo (USP) during the Hands-on Electrical Characterization of Advanced Transistors 2016



The organizers Joao Martino and Ricardo Rangel from University of Sao Paulo (USP), Paula Agopian from UNESP and the students of the 2016 characterization class

to extract experimentally the main electrical and physical characteristics in order to understand each device's behavior.

This course on electrical characterization was held at the University of Sao Paulo from November 28 to December 2, 2016 (40 hours), using devices fabricated at USP and outside the measurements rooms with state-of-the-art equipment.

This course was free of charge for the 15 students selected from design and devices researchers, teachers, graduate and undergraduate students of the Brazilian community.

For additional information, contact Prof. Joao Antonio Martino (martino@usp.br) or Prof. Paula Agopian (paula.agopian@sjbv.unesp.br).

~ Joao Antonio Martino, Editor

which will be held on April 18-20, 2017, at National Technical University of Ukraine "Kyiv Polytechnic Institute," Kyiv, Ukraine. The main sections of the conference will be:

- Section 1: Micro- and Nanoelectronics
- Section 2: Biomedical Electronics and Signal Processing
- Section 3: Electronic Systems

Please visit the conference website for more information: <http://el-nano.kpi.ua>.

A technical co-sponsorship will be also provided for the 2017 IEEE First Ukraine Conference on Electrical and Computer Engineering (UKRCON-2017), which will be held on May 29–June 2, 2017, at the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" Kyiv, Ukraine. The UKRCON-2017 general theme, 25th Anniversary of IEEE Ukraine Section, reflects the profound impact of IEEE on the Ukrainian science for the last 25 years. The main topics of the Conference will be:

- Track 1: Microwave Techniques, Antennas & Radar Systems
- Track 2: Bioengineering & Robotics
- Track 3: Energy Systems, Industry Application & Industry 4.0
- Track 4: Nanoelectronics & Photonics, Electron Devices & Embedded Systems
- Track 5: Systems Analysis, Computer Science & Infocommunications
- Track 6: Engineering Education & History

Details can be found on the conference website: <http://ukrcon.ieee.org.ua/>.

ED/IM/SSC Chapter of the Republic of Macedonia

Two invited lectures were organized by the Chapter:

- "Applications of the (so-called) Fujisaki Model of Tone, Accent and Intonation, to Phonetics, Phonology, and Speech Technology" for students at Multimedia Summer School, FEEIT, September 21, 2016, Skopje, Macedonia,
- "Problems and Prospects of Spoken Language Processing", Sep-

tember 26, 2016, at IEEE meeting, FEEIT, Skopje, Macedonia.

Lectures were delivered by Prof. Emeritus Hiroya Fujisaki, IEEE Life member, Distinguished Lecturer ('16-'17) of the ISCA.

ED/NPS/MTT/AP/CPMT Saratov-Penza Chapter –by Mikhail D. Prokhorov

The Chapter co-organized the 12th International Conference on Actual Problems of Electron Devices Engineering (APEDE' 2016), held on September 22–23, 2016, at Yuri Gagarin State Technical University of Saratov (Russian Federation). IEEE members participated actively in the organization of the APEDE'2016 Conference. Prof. Sergey

Nikitov (IEEE Russia Section Chair) was the General Chairman of the Program Committee. Dr. Alexey Miroshnichenko (Saratov-Penza Chapter Vice-Chair) served as the Executive Secretary of the Organizing Committee. Prof. Mikhail Prokhorov (Saratov-Penza Chapter Chair) and Prof. Nikita Ryskin (Saratov-Penza Chapter Treasurer) were the members of the Organizing Committee.

The Scientific Program of the conference was as follows:

- microwave electronics,
- vacuum microelectronics and nanoelectronics,
- microwave theory and techniques,
- power electronics,
- electron devices and instruments application and technology.



A talk during MMET-2016



Participants of MMET-2016

More than 150 participants from six countries (Russia, Belarus, Poland, Republic of Korea, Egypt, and Kazakhstan) took part in the APEDE'2016. The Conference Program included 7 plenary lectures presented by invited speakers, 120 talks, and 44 posters. For the young participants, the Best Student Paper Award competition was organized during the Conference. The book of the conference full-text proceedings was published and distributed among the participants. The Conference Proceedings were published and indexed in the IEEE Xplore Digital Library.

The APEDE'2016 Conference was co-sponsored by Keysight Technologies and Rohde & Schwarz. The Conference website: <http://apede.sstu.ru>.

~ Daniel Tomaszewski, Editor

ASIA & PACIFIC (REGION 10)

ED Harbin Institute of Technology Chapter

~by Sun Jianfeng

On Saturday, October 8, 2016, Academician of CAS, Prof. Ru Huang from Peking University, was invited to deliver an EDS Distinguished Lecture entitled "IC technology of Post Moore Era," by Prof. Ma Jing, the ED Harbin Chapter Chair. Before her academic talk, Prof. Huang introduced general information about EDS and the important benefits of being a member of the Society, which encouraged students to



Prof. Chao-Hsin Chien (6th from the right,) pictured with some members of the Chapter

join EDS to improve their self-development. Prof. Huang gave an overview of the leading-edge IC technologies, typical features of IC technologies of post Moore Era and future developing tendency. She spoke on the emerging logic and memory technology with new architecture, new mechanism and new materials, as well as new circuit design and MEMS related technology. There were about 80 attendees, and afterwards Prof. Huang had a discussion with our members and some of the students.

ED Beijing Chapter

~by Kangwei Zhang

On December 23, 2016, Prof. Chao-Hsin Chien from National Chiao Tung University, delivered a Distinguished Lecture entitled "S/D and Gate Dielectric Engineerings for Ge MOSFETs," at the Institute of Microelectronics of Chinese Academy of Sciences (IMECAS), held by the ED

Beijing Chapter. More than 40 local professionals and graduate students attended the meeting.

The current challenging issues include reducing S/D parasitic resistance and scaling EOT of dielectric in pursuing high performance Ge MOSFETs. In this talk, two key process modules, such S/D and gate dielectric techniques, were addressed for Ge MOSFETs. Prof. Chao-Hsin Chien showed his recent works on enhancing thermal stability up to 600 °C of NiGe metal alloy on Ge by TiN capping & scaling of gate dielectric down to < 1 nm with good Dit level and low leakage current. In addition, a novel NiPtGe metal S/D was presented for high performance Ge Schottky PMOSFETs. Not only electrical characteristics of Schottky junction but also device performances, such as on current, RS/D, Gm & SS, have been significantly improved by using NiPtGe.

ED Xi'an Chapter

~by Hongliang Lu

The chapter organized a few EDS Distinguished Lectures during the fourth quarter of 2016.

Prof. Qifa Zhou, a Research Professor at the NIH Resource Center for Medical Ultrasonic Transducer Technology and the Department of Biomedical Engineering at the University of Southern California, Los Angeles, California, visited the ED Xi'an Chapter on November 1, 2016, and delivered



Prof. Ru Huang (6th from the right) pictured with Prof. Ma Jing (5th from the right), the Chapter Advisor and some other members of the Chapter

a Distinguished Lecture entitled *"Integration and Applications of High-frequency Ultrasound,"* at Xidian University, Xi'an, China. About 50 local professionals and students attended the lecture. Prof. Zhou introduced an overview of the state of art in high-frequency ultrasound and array. Recently multi-modalities imaging methods which combined high-frequency ultrasound with optics were considered to be the next frontier in biomedical imaging. The development of integrated intravascular ultrasound and optical coherence tomography (IVUS-OCT), acoustic radiation force optical coherence elastography (ARF-OCE), and photoacoustic tomography/microscopic (PAT/PAM) were such examples. He also presented ultrasound integration on PMUT for semiconductor and finger printing. The DL received great attention and was highly appreciated.

On November 7, 2016, Dr. Guofu Niu presented a talk on *"Wide Temperature Range Compact Modeling of SiGe HBTs,"* held by the ED Xi'an Chapter at Xidian University, Xi'an, Shaanxi, China. Dr. Niu described the development of a wide temperature range SiGe HBT compact model that enabled integrated circuits design from 43K to 393K, based on the industry standard Mextram model. Since Silicon-Germanium Heterojunction Bipolar Transistors (SiGe HBTs) had demonstrated excellent electrical characteristics over an extremely wide temperature range, from as low as below 1K to as high as well over 400K. That, together with multi Mrad radiation hardness, made SiGe BiCMOS an excellent candidate for developing integrated electronics for outer space exploration. Moreover, he gave a brief overview of Auburn University's device research activities in the areas of development of the industry standard bipolar transistor model Mextram, RF/millimeter wave SiGe HBT/CMOS modeling/measurement and TCAD

On December 11, 2016, Dr. Qing-Guang Zhuang, Professor of National Taiwan University Taiwan, delivered a Distinguished Lecture entitled *"Mag-*

nificent New Electronic Era," at Xidian University, Xi'an, China. Around 50 students and teachers from the School of Microelectronics attended this lecture. Dr. Zhuang used HEMT (High Electron Mobility Transistor) and other electronics devices as an example to discuss the impact that manipulation of different kinds of materials has on the revolutionary modern devices. With the advent of the new post-Moore electronics era, interdisciplinary and cross-domain knowledge has enabled us to cope with the increasing demand for greater communication bandwidth and higher power efficiency. Dr. Zhuang also explained the new electronic era which has been changing our lives, and the elimination of the terahertz technology gap brought about by atomic manipulation and structural control. At the end of his lecture Dr. Zhuang answered some valuable questions.

ED Tainan Chapter

—by Wen-Kuan Yeh

The ED Tainan Chapter held a Distinguished Lecture at Kaohsiung, Taiwan, on December 21, 2016. Dr. Jiann-Shiun Yuan (Professor of Electrical Engineering, University of Central Florida), gave a talk at the National University of Kaohsiung. The DL

entitled *"Ultra-Low Power design and RF Circuit Reliability for Internet on Thing (IoT),"* focused on the design and reliability of Low-Power Devices on IoT Applications. About 30 students and several professors from local universities attended.

ED Taipei Chapter

—by Steve Chung

The ED Taipei Chapter together with the ED NCTU Student Chapter held one invited talk in the fourth quarter of 2016. The Distinguished Lecture, by Dr. Simon Deleonibus, Secretary of the EDS Board of Governors, was held on November 11th. He gave a talk entitled, *"The Energy and Variability Efficient Era (E.V.E.) is ahead of us-When More Moore and More than Moore will meet for 3D."* He began with a review of the trend of technology scaling along with the major commercial applications in the market, such as 80X CPU to the digital camera, smart phone, and now into the IoT era, then, Zero Intrinsic Variability and Zero Power become a necessity for the future in the realm of Heterogeneity. The increasing complexity of high volume fabricated systems will be possible if we aim at zero intrinsic variability, and



From front left to right: Dr. Wen-Teng Chang (Professor of NUK), Prof. Wen-Kuan Yeh (Chair of ED Tainan Chapter) Prof. Jiann-Shiun Yuan (Distinguished Lecturer), and Prof. Te-Kung Chiang (Professor of NUK), with some of the attendees



Prof. Steve Chung (front row, 5th from right) and Dr. Simon Deleonibus (4th from right),
Prof. K. N. Chen (6th from right)

generalize 3-dimensional integration of hybrid, heterogeneous technologies at the device, functional and system levels. He then demonstrated several cases on the heterogeneous 3D co-integration on silicon towards zero power systems. This talk was attended by approximately 60 graduate students, professors, and post-doc researchers.

EDS Mini-Colloquium—ED Peking University Student Branch Chapter

—by Xiaobo Jiang

An IEEE EDS Mini-Colloquium (MQ) on Emerging Materials and Devices, organized by the ED Peking University (PKU) Student Branch Chapter, was successfully held on October 24, 2016, at Peking University, Beijing, China. This MQ was supported by the following outstanding lecturers: Prof. H.-S. Philip Wong of Stanford University, Prof. Mansun Chan

of Hong Kong University of Science and Technology, Prof. Bin Yu of State University of New York at Albany, and Prof. Tian-Ling Ren of Tsinghua University. Among them, Prof. Chan, Prof. Yu and Prof. Ren are EDS Distinguished Lecturers. This event attracted more than 60 people from PKU and other affiliations.

In the morning, Prof. Ru Huang, advisor of the ED Peking University Student Branch Chapter, gave the welcome address. The MQ began with Prof. Chan's talk on *"Carbon Nanotube Enhanced CMOS Interconnect Technology,"* followed by Prof. Wong, speaking on *"Memory—the N3XT Frontier."* After a short coffee break, Prof. Yu gave a talk on *"Future Devices Enabled by 2D Nanomaterials,"* followed by Prof. Ren's talk on *"Novel Fabrication Method and Applications of Graphene."* These lectures covered some broad range topics on current interests and also produced lively, interactive discussions.

EDS Mini-Colloquium—ED Hangzhou Chapter

—by Lingling Sun

On October 24, 2016, an EDS MQ on micro & nanoelectronics devices and integrated circuits was successfully held at Hangzhou Dianzi University (HDU). This MQ was jointly organized by the ED Hangzhou Chapter, Hangzhou Dianzi University, Key Laboratory of RF Circuits and Systems of Ministry of Education, and Key Laboratory of VLSI of Zhejiang Province. The guests attending the MQ were Prof. Samar Saha from Santa Clara University, Prof. Cor Claeys from IMEC & KU Leuven, Prof. J. A. Martino from Sao Paulo University, Prof. Xing Zhou from Nanyang Technological University, Singapore, Prof. Durga Misra from New Jersey Institute of Technology, Prof. Ru Huang from Peking University, Prof. Changjian Zhou from South China University of Technology, and Prof. Lingling Sun, Prof. Zhiqun Cheng, Prof. Gaofeng Wang from HDU. During the MQ, the DL speakers gave interesting presentations on a variety of topics related to micro/nano devices and integrated circuits, such as *"Challenge of Advanced Semiconductor Devices for future CMOS Technologies," "Field Effect Transistors: From MOSFET to Tunnel FET," "All-Carbon Interconnects—From 1D to 3D," "Generic HEMT Compact Model for Future Hybrid III-V/CMOS Technology,"* and *"High-k gate stack processing on Si and Ge Substrate for sub-14 nm CMOS technology."*

2016 IEDMS

—by Steve Chung

The annual conference, called 2016 IEDMS (International Electron Devices and Materials Symposium), <http://iedms2016.ntnu.edu.tw/index.html>, was held November 24–25, at the National Taiwan Normal University in Taipei, serving as a platform for all researchers in Taiwan to present an annual review of their projects (in poster form) sponsored by the government. The event is similar to



First row, starting 4th from left: Prof. Mansun Chan, Prof. Bin Yu, Prof. H.-S. Philip Wong,
Prof. Ru Huang and Prof. Tian-Ling Ren, with some of the MQ participants

the SSDM in Japan. The conference was organized by volunteers of the local ED chapter. Also, this conference called for contributed papers from around the world. This year's program featured 3 keynote speeches, 15 invited speeches, 53 contributed oral papers, and 148 poster papers, which were well organized in the following four areas: (a) Compound Semiconductor Materials and Electronic and Photonic Devices, (b) Sustainable Energy Devices and Materials, (c) Integrated Circuits and Packaging Technologies, and (d) Nanoscale Devices and Materials, Displays, and Sensors. The conference attracted more than 300 participants. Next year, the IEDMS conference venue will be held in early September 2017 at National Chiao Tung University, near the Science Park in Hsinchu, Taiwan. Please make a note on your calendar for paper submissions due in June 2017.

2016 Workshop for Advanced Device and Material

—by Wen-Kuan Yeh

The ED Tainan Chapter co-organized the 2016 Workshop of Characterization for Advanced Device and Material, at National Nano Device Laboratories, Hsinchu, Taiwan, November 30th. This Workshop focused on “New material and characterization on advanced device.” The following seven keynote speakers were invited to give a talk: “Contact Engineering for 2D Field-effect Transistors,” by Dr. Po-Wen Chiu, Professor of Department of Electrical Engineering, National Tsing Hua University, Taiwan; “Enhancing Surface and Thin Film Analysis with XPS through In-Situ Complementary Spectroscopies,” by Dr. Tim Nunney, Product Manager Thermo Fisher Scientific; “Strain Analysis Tools in Electron Microscope,” by Yieng-Chieh Hung, Manager JieDong Co., Ltd; “Grain Size and Plasma Doping effects on CVD based 2D Transition Metal Dichalcogenide,” by Dr. Tuo-Hung Hou, Professor of Department of Electronics Engineering and Institute of Electronics; “The Character-

ization of 2D Device and Thin Film by X-Ray Technology,” by Dr. Umesh Tiwari, Product Manager, Asia Pacific Region, “Recent Advance in Nano-mechanical and Nanoelectrical Property Mapping by AFM-based Technology: PF-QNM, SMIM and Nano-indentation,” by Yen-Fu Chen, Sr. Sales Representative Bruker Taiwan; and “Determining Molecular Orientations in Materials Using Polarized Raman Spectroscopy,” by Dr. Robert Heintz, Product Applications Specialist. There were about 100 attendees, including professors, IEEE members, students and local professionals from Taiwan.

~ Ming Liu, Editor

ED Japan Joint Chapter

—by Masaaki Niwa and Takahiro Shinada

On February 15, 2017, the annual meeting of the ED Japan Chapter was held at the University of Tokyo. Prof. Masaaki Niwa, Japan Chapter Chair and Dr. Akira Nishiyama, Vice

Chair, reported 2016 activities and 2017 plans of the Chapter, in which the chapter name change from “Japan Chapter” to “Japan Joint Chapter” was reported and approved. At the meeting, the 2016 ED Japan Chapter Student Award (VLSI & IEDM) was presented to 10 students, who made excellent presentations at the Symposia 2016 and IEDM 2016. The award winners are posted on the Japan Chapter's website; (http://www.ieee-jp.org/japancouncil/chapter/ED-15/ed15_award.htm).

After the annual meeting, the IEDM 2016 Report Session was held. Seven Japanese members of the IEDM program committee reported on summary, topics and research trends of their sub-committees for more than sixty attendees. This session provided a good opportunity for the attendees to understand the research trends of various areas, especially for those who were not able to attend the IEDM.

The executive committee meeting of the ED Japan Chapter was also held on the same day and the



15th ED Japan Chapter Student Award winners, together with Prof. Masaaki Niwa; Chair, and Dr. Akira Nishiyama; Vice Chair on February 15, 2017, Tokyo



The annual meeting of EDS Japan Chapter attendees on February, 15, 2017, Tokyo



The executive committee meeting of the ED Japan Joint Chapter on February 15, 2017, Tokyo

plans for 2017 of the Chapter were approved. The ED Japan Chapter Executives, Prof. Masaaki Niwa, Chair; Dr. Akira Nishiyama, Vice Chair; Prof. Takahiro Shinada, Secretary; and Dr. Shigeru Kawanaka, Treasurer; invited the guests, the 6 guest speakers of the IEDM Report Session, as well as Prof. Hiroshi Iwai, Past President of IEEE EDS, Prof. Akira Toriumi and Dr. Toru Mogami, Past Chairs of the ED Japan Chapter, Koji Kita, Past Secretary of the chapter and people concerned.

~ Kuniyuki Kakushima, Editor

ED Malaysia Kuala Lumpur Chapter

—by Badariah Bais and Noorjannah Ibrahim

EDS-ETC Program and GENERIC Event

On September 26–28, 2016, the Kuliyah of Engineering, International



School students using the Snap Circuits kits during the GENERIC event

Islamic University Malaysia held an event called ENGITEX. In this event, the ED Malaysia Chapter had the opportunity to co-organize a sub-event called GENERIC, which involved the participation of primary and secondary school students to inculcate interest in Science, Technology,

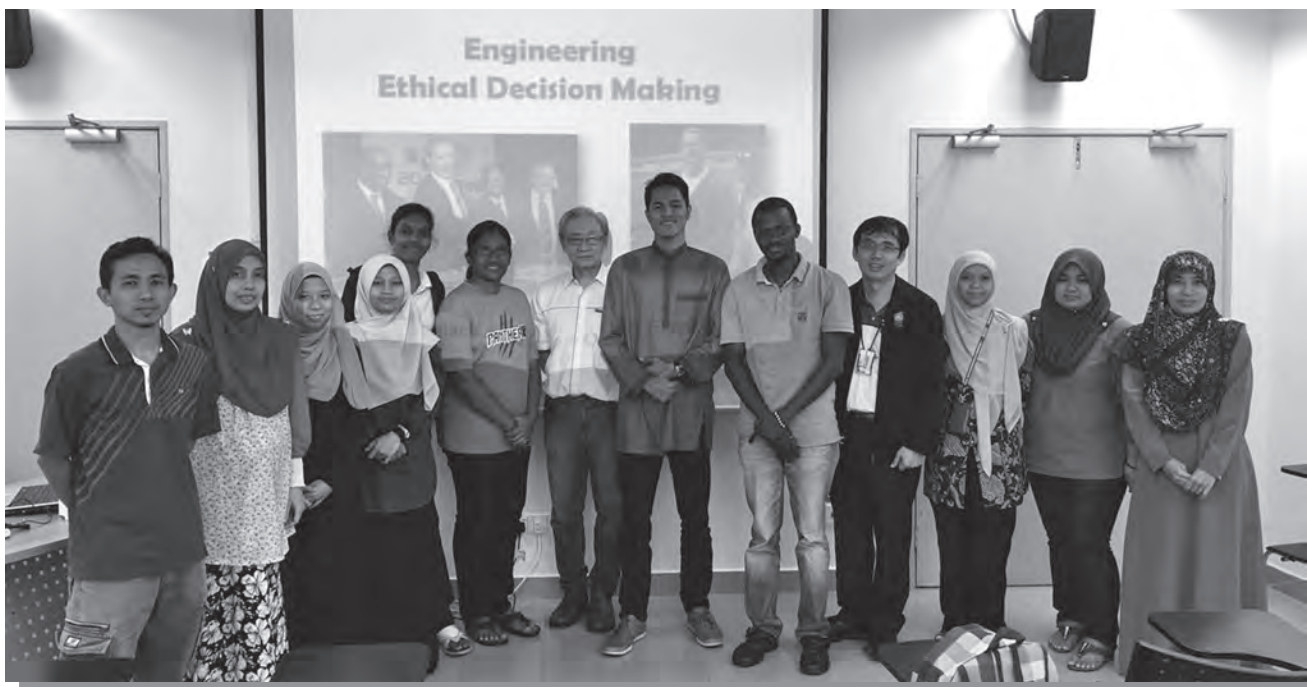
Engineering and Mathematics (STEM). There were 45 student participants from primary schools and 33 students from secondary schools from the Kuala Lumpur area. The program was divided into two parts; Generation of Engineers for primary school and Eco Race Challenge for secondary school. Participants were required to answer some questions regarding the experiments using Snap Circuits kits conducted in the Eco Race Challenge.

Distinguished Lecture and Visit by EDS Vice President

The Chapter in collaboration with the EDS UKM Student Branch Chapter, successfully organized a Distinguished Lecture (DL) by Dr. M. K. Radhakrishnan on November 7, 2016. The event was co-organized with the Institute of Microengineering and Nanoelectronic (IMEN), UKM. Dr. Radhakrishnan is the EDS Vice-President of Regions & Chapters and a Member of the Board of Governors of the IEEE Electron Devices Society. He has been an EDS Distinguished Lecturer since 1997 and presented a talk *entitled "Electrostatic discharge (ESD) Issues and Challenges in Si Nanometer Devices."* There were about 28 participants comprising of staff and students from IMEN and UKM. After his talk, Dr. Radhakrishnan held a short meeting with the student branch members to discuss upcoming activities.



Dr. M. K. Radhakrishnan and the participants after the talk



Ir Cheang Kok Meng and participants

Technical Talk by Ir Cheang Kok Meng

The Chapter with the collaboration with ED UKM Student Branch Chapter successfully organized a technical talk by Ir Cheang Kok Meng on December 9, 2016, at UKM. He is a visiting lecturer in several universities where he speaks on Engineering Ethics, Technology & Society, Professional Development and Broadcast Systems. His presentation was entitled, *"The Thin Line between Right and Wrong-Ethics in Engineering."* The event was co-organized by Pusat Citra, UKM. There were about 16 participants consisting

of academic staff, postgraduate and undergraduate students from UKM.

~ P. Sushitha Menon, Editor

ED Kolkata Chapter

–by Atanu Kundu, Angsuman Sarkar and Swapnadip De

The ED MSIT Student Branch Chapter, MSIT Student Branch, ED Kolkata Chapter and SSCS Kolkata Chapter, in association with the Department of ECE, MSIT, jointly organized the 1st International Conference VLSI DCS 2016 at MSIT, October 19–20, 2016.



Dr. Writam Banerjee (right), the keynote speaker, being felicitated at VLSI DCS 2016

The 1st International Conference NanoBioCon 2016, was organized by Maulana Abul Kalam Azad University of Technology on October 3–5, 2016, at the Science City Auditorium. The conference was technically co-sponsored by the EDS Kolkata Chapter and sponsored by TEQIP II WBUT.

ED Meghnad Saha Institute of Technology Student Branch Chapter

–by Manash Chanda and Swapnadip De

The ED MSIT Student Branch Chapter, IEEE MSIT Student Branch, ED Kolkata Chapter and SSCS Kolkata Chapter, in association with the Department of



Inauguration of VLSI DCS 2016 at MSIT

ECE, MSIT, jointly organized the 1st International Conference VLSI DCS 2016 at MSIT on October 19-20, 2016. The Conference was technically co-sponsored by the IEEE Kolkata Section. Prof. Writam Banerjee, Assistant Professor of the Institute of Microelectronics, Chinese Academy of Science, P.R. China, delivered the keynote speech. Prof. C. K. Sarkar, EDS Distinguished Lecturer and Professor of ETCE Department of Jadavpur University, and Prof. Subir Kumar Sarkar, EDS Distinguished Lecturer and Professor of ETCE Department of Jadavpur University delivered talks for the program. Dr. Angsuman Sarkar, Associate Professor of Kalyani Government Engineering College, Dr. Atanu Kundu, Assistant Professor of HITK, Kolkata and Prof. Debaprasad Das, Professor of Assam University, also delivered Technical Talks at the Conference. In total, 37 papers were selected for oral presentation. The program was attended by 120 participants of whom 50 were IEEE members.



Attendees of technical lecture on November 8th

ED NIST Student Chapter, Berhampur

—by Ajit Kumar Panda

The chapter organized the IEEE Technical Lecture on “*Low-Voltage CMOS Analog Circuit Design and Active Materials,*” November, 8, 2016, at National Institute of Science & Tech-

nology, Palur Hill, and Berhampur. Dr. Saroj Rout, Mixgnal Innovations, discussed RF circuits and their testing. He was interested in CMOS RF Circuit design and the suitable materials used for this. He highlighted the dimensions of research activities in this domain. Approximately 30 participants attended the lecture. The chapter also organized the IEEE Bhubaneswar Sub-Section Executive Committee meeting on November 19th, at the National Institute of Science & Technology (NIST), Palur Hill, and Berhampur, which was attended by Prof. P. K. Dash, SOA University, Dr. S. R. Samantaray, IIT-Bhubaneswar, A. K. Tripathy, SIT-Bhubaneswar, Prof. A. K. Panda, NIST-Berhampur.

The Chapter organized a half-day workshop on “*Smart Grid Technologies,*” November 19th, at NIST for young faculties, researchers and students, to explore new ideas and thoughts by young researchers. Thirty-four faculties and researchers attended the program from different universities and institutes. Prof. P. K. Dash, SOA University, discussed the basic electrical science and real-life solutions for energy conservation and smart power transmission in India and other countries. Dr. S. R. Samantaray discussed smart technologies and power grid. Professor A. K. Tripathy highlighted the power generation and transmission.



Inauguration of VLSI DCS 2016 at MSIT



The organizers and participants at the valedictory session of VLSI DCS 2016



Attendees of the Executive Committee Meeting

were taught to the students. Feedback forms were collected at the end of the session and the students were much impressed and excited to receive this hands-on training. Nearly 40 students attended this workshop.

ED NIT Silchar Student Branch Chapter

–by Trupti Ranjan Lenka

The ED NIT Silchar Student Branch Chapter organized an EDS-ETC program at Saint Capitanio School, Silchar, Assam, October 21, 2016. Thirty-five students of Science Stream of 11th Standard attended.

The Department of Electronics and Communication Engineering, NIT Silchar, in association with the ED NIT Silchar Student Branch Chapter, organized a 3-day Short Term Training Program on “Emerging Devices and VLSI Physical Design,” October 25–27, 2016, at Department of ECE, National Institute of Technology Silchar, which

ED Coimbatore Chapter

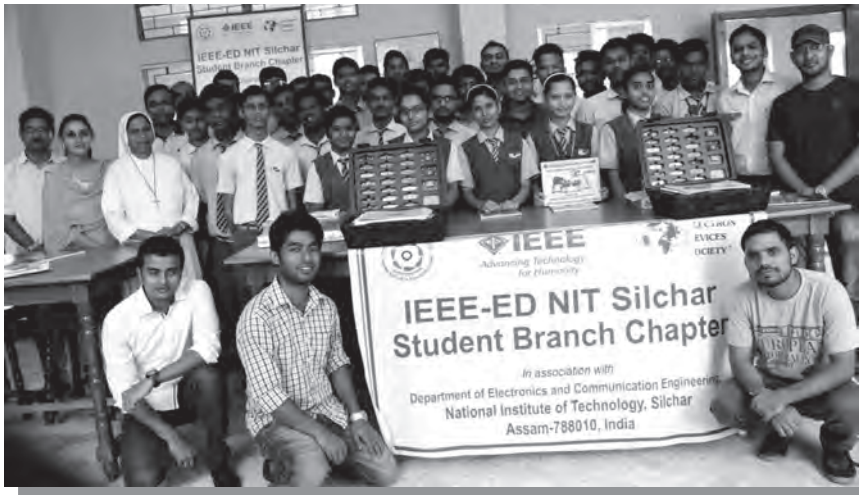
–by D. Nirmal

On November 19, 2016, the chapter and Department of Electronics & Communication Karunya University jointly conducted a hands-on training on Engineers Demonstrating Science:

an EngineerTeacher Connection (EDS-ETC) Program to the SSLC students of government higher secondary school, in Nathegoundenpudur. The trainers were third year students of ECE as well as IEEE student volunteers. The basic electronics terminologies, components, sensors and its application



IEEE volunteers and students at the EDS-ETC program held in Nathegoundenpudur



Faculty, Principal, St. Capitanio School, Dr. T. R. Lenka (left), Faculty Advisor, Student participants, Rupam Goswami, Student Chair (center) and IEEE Student Members



Keynote address by Prof. Sandeep Sancheti, President Manipal University

future flexible Electronics; Dr. Jai Gopal Pandey, Sr. Scientist CEERI Pilani, discussed System-on-Chip (SoC) Design using Platform FPGAs and Dr. Rohit Bhakar discussed various Challenges for Power System Operation in uncertain environment.

The second day had six technical sessions: Dr. Manish Tiwari discussed emerging areas of Photonic Crystal Fibers: Theory and Applications; Dr. Savesh Dubey discussed carrier transport mechanism in nanoscale transistors; Dr. Ghanshyam Singh talked about Photonic Integrated Devices and Systems: Technology for next Generation Telecom Networks; Dr. Rajesh Kumar explained the relevance of Smart Grids; Mr. Ashish Raj discussed PUs energy club and Dr. Manoj Gupta discussed innovations in engineering.

ED Delhi Chapter

—by Mridula Gupta and Manoj Saxena

On September 26, 2016, the chapter organized an EDS Distinguished Lecture (DL) on “Innovation and Career Opportunities in Microelectronics” by Dr. Rakesh Kumar, Life Fellow IEEE, President, TCX Technology Conventions. The chapter also organized an EDS Mini-Colloquium on Nano-electronic Devices, October 14, 2016, at IIT Delhi. The invited speakers were Prof. Hiroshi Iwai (Distinguished Chair Professor, National Chiao Tung University, and Prof. (Emeritus), Tokyo Institute of Technology), Prof. V. Ramgopal Rao (Director, IIT Delhi);



(From left) Dr. T. R. Lenka, Faculty Advisor, Dr. K. L. Baishnab, HOD ECE, Dr. K. Guha, Prof. A. Mallik, Prof. S. Baishya, Dr. B. Bhowmick, Mr. Rupam Goswami, Student Chair (center front), participants and EDS Student Members

was attended by 45 scholars, researchers and faculty members. The Guest Speakers of the program were Prof. S. C. Nandy, ISI, Kolkata, and Prof. A. Mallik, University of Calcutta and Prof. S. Baishya with Dr. K. Guha of NIT Silchar. Prof. Nandy presented his lecture on optimization methods of VLSI, and geometry of rectangles. Prof. Mallik talked on Tunnel Field Effect Transistors (TFETs), their basics, and their low power applications with a focus on modified geometries of TFETs. Prof. Baishya took up topics on insights into analytical modeling of diodes, and explained in detail the modeling methods of 2D and 3D MOS-based devices. Dr. Guha highlighted the importance of MEMS-based devices and their applications.

ED Poornima University—Jaipur Student Branch Chapter

—by Arun Dev Dhar Dwivedi

The chapter organized a two-day National Seminar on Advances and Innovations in Electrical Electronics and Communication Engineering (AIEECE-2016), November 16–17, 2016. Prof. Sandeep Sancheti delivered a Keynote address on a Digital World driven by Technological Advancements and Professor Vineet Sahula spoke on Trust and Security in Hardware: Concepts and issues. The first day of the seminar included three technical sessions: Dr. S. P. Tiwari, Assistant Professor EE, IIT Jodhpur, highlighted emerging areas of organic electronics, especially organic transistors for

Prof. ChunYen Chang (former President, National Chiao Tung University); and Prof. EdwardY. Chang (Senior Vice President, National Chiao Tung University). More than 70 students and faculty members attended the mini-colloquium. On November 10th, a DL *"On Negative Bias Temperature Instability in HKMG MOSFETs—Characterization, Process Dependence, DC/AC Modeling, TCAD Implementation and Stochastic Effects,"* was delivered at University of Delhi South Campus, New Delhi, by Prof. Souvik Mahapatra, Fellow IEEE, Department of Electrical Engineering, IIT Bombay, Mumbai, India.

ED VIT Vellore Chapter

—by Sivasankaran K.

The ED VIT Chapter organized a two-day national level hands-on training on *"TCAD for IC Design"* from September 16–17, 2016, by Dr. V. N. Ramakrishnan, Associate Professor, VIT University, Vellore. The main aim of this training program was to address the gap between circuit simulators and TCAD, which allows process and device engineers to virtually manufacture any type of device before processing them.

The chapter along with other five IEEE VIT chapters organized a two day IEEE Colloquium on *"Emerging Trends in Electronic Systems,"* October 14–15, 2016. The main aim of the colloquium was to provide a global platform for the engineers, scientists and academicians, especially young researchers across the country to exchange their new ideas, explore emerging directions in the fields of electronic devices, circuits and systems, microwave techniques, signal processing, communication engineering, internet of things and engineering in biomedical sciences. Two EDS Distinguished Lectures on *"Emerging Trends in Nanoelectronics"* and *"Modeling and Simulation of Nanoscale Devices"* were given by Dr. M. K. Radhakrishnan, EDS Vice President of Regions and Chapters,



Dr. Radhakrishnan and Dr. Saxena (3rd and 2nd from right), at the ED VIT Chapter Two-Day EDS Colloquium on *"Emerging Trends in Electronic Systems"*

and Dr. Manoj Saxena, Vice Chair of EDS Region 10 Subcommittee for Regions and Chapters, respectively. After the sessions, both DLs interacted with ED VIT student chapter office bearers.

EDS Uttar Pradesh Chapter

—by Yogesh Chauhan

On November 19, 2016, the chapter organized a one-day Workshop on Electron Devices 2016 (WED'16), hosted by the Indian Institute of Information Technology Allahabad (IIITA). The workshop was sponsored by the IEEE UP Section, and co-sponsored by Quantumwise, IMS-India. The focus of this workshop was to discuss the recent advancement in electron devices with their well-recognized and promising applications and meant to promote students,

young professionals and women in science and technology. There were six technical talks: Prof. Santanu Mahapatra, Indian Institute of Science Bangalore; Suchandan Pal, Principal Scientist at CSIR-CEERI Pilani; Yogesh Singh Chauhan, Associate Professor, Indian Institute of Technology Kanpur; Nihar Ranjan Mohapatra, Associate Professor, Indian Institute of Technology, Gandhinagar; Shree Prakash Tiwari, Assistant Professor, Indian Institute of Technology Jodhpur and Arun Dubey, Sr. Application Engineer, Quantumwise (Integrated Microsystems), India. Around 80 candidates from outside, as well as the host institute, participated. A total of 60 candidates (students and faculty members) around the country registered for the event.

~ Manoj Saxena, Editor



Participants of the Workshop on Electron Devices 2016 (WED'16)

EDS MEETINGS CALENDAR



THE COMPLETE EDS CALENDAR CAN BE FOUND AT OUR WEB SITE:
[HTTP://EDS.IEEE.ORG](http://eds.ieee.org). PLEASE VISIT.

2017 IEEE International Reliability Physics Symposium (IRPS)	02 Apr–06 Apr 2017	Hyatt Regency Monterey One Old Golf Course Road Monterey, CA, USA
2017 Joint International EUROSIO Workshop and International Conference on Ultimate Integration on Silicon (EUROSIO-ULIS)	03 Apr–05 Apr 2017	Divani Caravel Hotel Vasileos Alexandrou 2 Athens, Greece
2017 International Symposium on VLSI Design, Automation and Test (VLSI-DAT)	24 Apr–27 Apr 2017	Ambassador Hotel Hsinchu 188 Chung Hwa Road, Section 2, Hsinchu, Taiwan Hsinchu, Taiwan
2017 Eighteenth International Vacuum Electronics Conference (IVEC)	24 Apr–26 Apr 2017	99 City Road Conference Centre 99 City Road London, United Kingdom
2017 International Symposium on VLSI Technology, Systems and Application (VLSI-TSA)	24 Apr–27 Apr 2017	Ambassador Hotel Hsinchu Taiwan
2017 IEEE International Memory Workshop (IMW)	14 May–17 May 2017	Hyatt Regency Monterey One Old Golf Course Road Monterey, CA, USA
2017 28th Annual SEMI Advanced Semiconductor Manufacturing Conference (ASMC)	15 May–18 May 2017	Saratoga Springs City Center 522 Broadway Saratoga Springs, NY, USA
2017 IEEE International Interconnect Technology Conference (IITC)	16 May–18 May 2017	Ambassador Hotel 188, Section 2 Zhonghua Road Hsinchu, Taiwan

2017 29th International Symposium on Power Semiconductor Devices and IC's (ISPSD)	28 May–01 Jun 2017	Royton Sapporo Kita 1 jyou nishi 11-1 Chuo-ku Sapporo Sapporo, Japan
2017 Silicon Nanoelectronics Workshop (SNW)	04 Jun–05 Jun 2017	Rihga Royal Hotel Kyoto 1 Taimatsu-cho, Shiokoji-sagaru, HigashiHorikawa-dori, Shimogyo-ku Kyoto, Japan
2017 IEEE Radio Frequency Integrated Circuits Symposium (RFIC)	04 Jun–06 Jun 2017	Hawaii Convention Center 1801 Kalakaua Ave Honolulu, HI, USA
2017 Symposium on VLSI Technology	05 Jun–08 Jun 2017	Rihga Royal Hotel 1 Taimatsu-Cho Shiokoji-sagaru Higashi Horikawa-dori Kyoto, Japan
2017 19th International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS)	18 Jun–22 Jun 2017	Kaohsiung Exhibition Center No. 39, Chenggong 2nd Road Qianzhen District Kaohsiung, Taiwan
2017 IEEE 44th Photovoltaic Specialists Conference (PVSC)	25 Jun–30 Jun 2017	Marriott Washington Wardman Park 2660 Woodley Road NW Washington, DC, USA
2017 75th Device Research Conference (DRC)	25 Jun–28 Jun 2017	University of Notre Dame 130 Morris Inn Notre Dame, IN, USA
2017 International Siberian Conference on Control and Communications (SIBCON)	29 Jun–30 Jun 2017	Sultanbek S. Isenov KATU Pobedy Ave., 62 Astana Astana, Kazakhstan

2017 24th International Workshop on Active-Matrix Flatpanel Displays and Devices (AM-FPD)	04 Jul–07 Jul 2017	Ryukoku University Avanti Kyoto Hall 31 Nishi Sanno-cho Higashi Kujo Minami-ku Kyoto, Japan
2017 30th International Vacuum Nanoelectronics Conference (IVNC)	10 Jul–14 Jul 2017	Herzogssaal Regensburg Domplatz 3 Regensburg, Germany
2017 International conference on Microelectronic Devices, Circuits and Systems (ICMDCS)	10 Aug–12 Aug 2017	VIT University Vellore Vellore, India
2017 International Conference on Simulation of Semiconductor Processes and Devices (SISPAD)	07 Sep–09 Sep 2017	Kamakura Prince Hotel 1-2-18 Shichirigahama-higashi Kamakura Kanagawa Japan
2017 39th Electrical Overstress/Electrostatic Discharge Symposium (EOS/ESD)	10 Sep–14 Sep 2017	Westin La Paloma Tucson, AZ, USA
ESSDERC 2017 - 47th IEEE European Solid-State Device Research Conference (ESSDERC)	11 Sep–14 Sep 2017	KU Leuven Campus Social Sciences Leuven, Belgium
2017 IEEE International Integrated Reliability Workshop (IIRW)	08 Oct–12 Oct 2017	Stanford Sierra Conference Center 130 Fallen Leaf Road South Lake Tahoe, CA, USA
2017 12th European Microwave Integrated Circuits Conference (EuMIC)	08 Oct–10 Oct 2017	NÜRNBERG CONVENTION CENTER (NCC) Messezentrum, NCC Ost Nuremberg, Germany

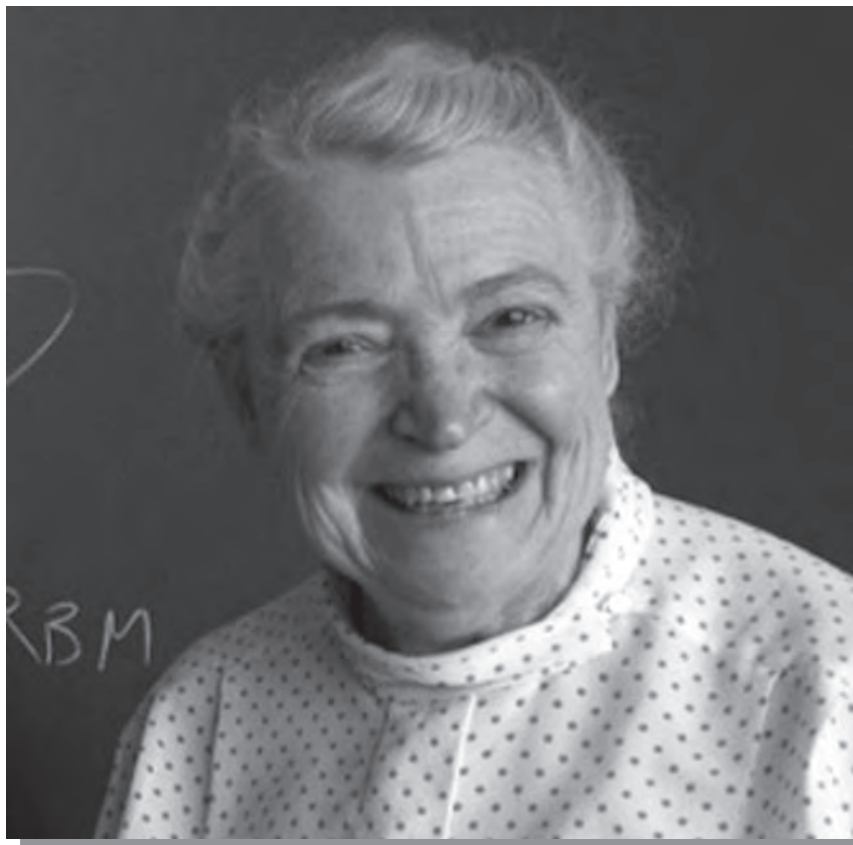
REMEMBERING MILDRED DRESSELHAUS

EDS MOURNS THE PASSING OF SOCIETY'S BELOVED CELEBRATED MEMBER, "CARBON QUEEN," PROFESSOR MILDRED DRESSELHAUS

Professor Mildred Dresselhaus, an Institute Professor and Professor Emerita of physics and electrical engineering at the Massachusetts Institute of Technology (MIT), passed away on February 20, 2017, at the age of 86.

Professor Dresselhaus was an exceptionally creative scientist and engineer who pioneered the research work on nanomaterials and was the first to exploit the thermoelectric effect at the nanoscale to efficiently harvest energy from the temperature differences in materials that conduct electricity. She was one of the first scientists with a vision to make carbon nanotubes (CNT). Her pioneering work on CNT earned her the nick name, *Carbon Queen*.

Professor Dresselhaus was heavily involved in activities that promote the increased participation of women in science and engineering. She received 36 honorary doctorates worldwide, and the National Medal of Science, the IEEE Medal of Honor, the Nicholson Medal for Humanitarian Service, the Compton Award, the Fermi Prize, the Kavli Prize, and the U.S. Presidential Medal of Freedom. And, she was honored as the 2016



IEEE Electron Devices Society (EDS) Celebrated Member.

The EDS is deeply saddened by the death of Professor Dresselhaus

and will miss the Society's beloved Celebrated Member.

*Samar Saha
EDS President*



SUMMARY OF CHANGES TO THE EDS FIELD OF INTEREST STATEMENT

At its May 29, 2016, Governance Meeting in Grenoble, France, the EDS Board of Governors approved the changes to the EDS Field of Interest to comply with the IEEE policy for total word counts. These amendments were then approved in November 2016 by the IEEE Technical Activities Board (TAB). The changes can take effect 30 days following their publication in this issue of the Newsletter (distributed to all EDS members), unless objections are received by 5% of the membership. Below is the current and approved revised EDS FOI.

If you have any objections to this change, please advise the EDS Executive Office staff by sending an email to l.riello@ieee.org.

EDS Field of Interest (*before revision*)

The field of interest for EDS is all aspects of engineering, physics, theory, experiment and simulation of electron and ion devices involving insulators, metals, organic materials, plasmas, semiconductors, quantum-effect materials, vacuum, and emerging materials. Specific applications of these devices include bioelectronics, biomedical, computation, communications, displays, electro and micro mechanics, imaging, micro actuators, optical, photo-voltaics, power, sensors and signal processing.

The society is concerned with research, development, design and manufacture related to the materials, processing, technology, and applications of such devices, and scientific, technical, educational and other activities that contribute to the advancement of this field.

Revised EDS Field of Interest Approved by IEEE TAB and EDS BoG

The EDS field-of-interest includes all electron and ion based devices, in their classical or quantum states, using environments and materials in their lowest to highest conducting phase, in simple or engineered assembly, interacting with and delivering photo-electronic, electro-magnetic, electromechanical, electro-thermal, and bio-electronic signals. The Society sponsors and reports on education, research, development and manufacturing aspects and is involved in science, theory, engineering, experimentation, simulation, modeling, design, fabrication, interconnection, reliability of such devices and their applications.

*Samar Saha
EDS President*