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TECHNICAL BRIEFS

ANNOUNCING AN EDS NEWSLETTER TECHNICAL ARTICLE SERIES

"MARVELS OF MICROELECTRONIC ENGINEERING"



Joachim N.
Burghartz



Simon Deleonibus

Microelectronics have been successful in more than 50 years of continuous advancement following Gordon Moore's vision from 1965. This progress became possible mostly through directed progress in device technology, following the ITRS roadmap. However, there were also unexpected discoveries and coinci-

dental inventions that had a distinct and even fundamental impact on the art of microelectronics. Those achievements will be highlighted in a series of articles in the EDS Newsletter in 2018 and 2019 as outlined below:

- Overview by J. Burghartz and S. Deleonibus
- Technology Marvels
- Device Marvels
- Process Marvels
- Material Marvels
- Technique Marvels

This series of articles has been initiated by Joachim N. Burghartz at the Institute for Microelectronics Stuttgart (IMS CHIPS), and will be edited by him and Simon Deleonibus.

SAVE THE DATE!

EDS Governance Meeting Series
1–3 June 2018
Cartagena, Colombia

YOUR COMMENTS SOLICITED

Your comments are most welcome. Please write directly to the Editor-in-Chief of the Newsletter at clilley@uic.edu

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REGION 10

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CONTRIBUTIONS WELCOME

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

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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

<u>ISSUE</u>	<u>DUE DATE</u>
July	April 1st
October	July 1st
January	October 1st
April	January 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.

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ENCOURAGING THE STUDY OF ENGINEERING THROUGH THE EDS—ETC PROGRAM

LUIS QUEVEDO, MEMBER, IEEE JWVG S.A.S BOGOTÁ, COLOMBIA

Abstract. This paper reports the results achieved since the inception of the *Engineers Demonstrating Science: an Engineer Teacher Connection* (EDS-ETC) pre-college outreach initiative developed by the IEEE Electron Devices Society (EDS) in 2010. The goal of this program is to promote the pursuit of STEM related careers at an early age with a gender balanced approach. The program also aims to nurture future generations of engineers by introducing basic aspects of electronics and programming in a fun and pedagogically sound format that is robust, inexpensive, and easy to replicate throughout the world.

Index Terms—Electron Devices Society, EDS, EDS-ETC, Snap Circuits, STEM.

Introduction

As a solution to the global challenge to increase the number of students that choose to study engineering at a college level, while promoting increased gender balance and to support the introduction of STEM [1] content, particularly in electronics at an elementary school level the Electron Devices Society EDS created the *Engineers Demonstrating Science: An Engineer Teacher Connection* EDS-ETC.

Based on Snap Circuits kits [2]; a cost effective, easy to use, resilient tool that introduces several basic concepts of electrical engineering to children. This is building on a pedagogically sound, hands-on approach in order to reinforce learning through visual and tactile feedback. The program was designed with the purpose of inspiring more students to select engineering careers once they reached the college level. Providing a practical solution for the lack of engaging tools, that capture the student's attention as they are introduced to the pursuit of sciences at a young age [3].

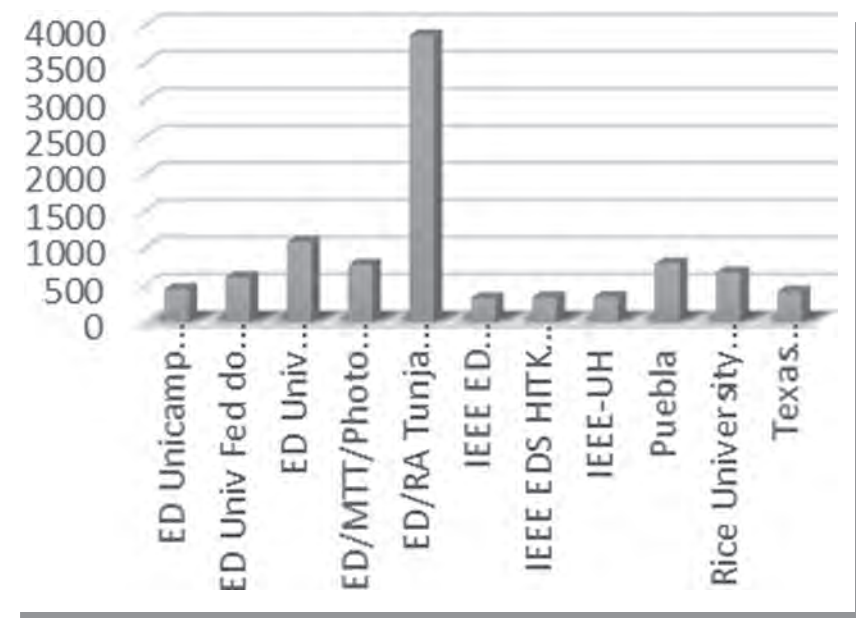


Fig.1. EDS student chapters with the largest number of trained students (c) 2018 IEEE

The program is based on its support by Electron Devices Society (EDS) volunteers from student branches at a global level. Overall program information is readily available online [4].

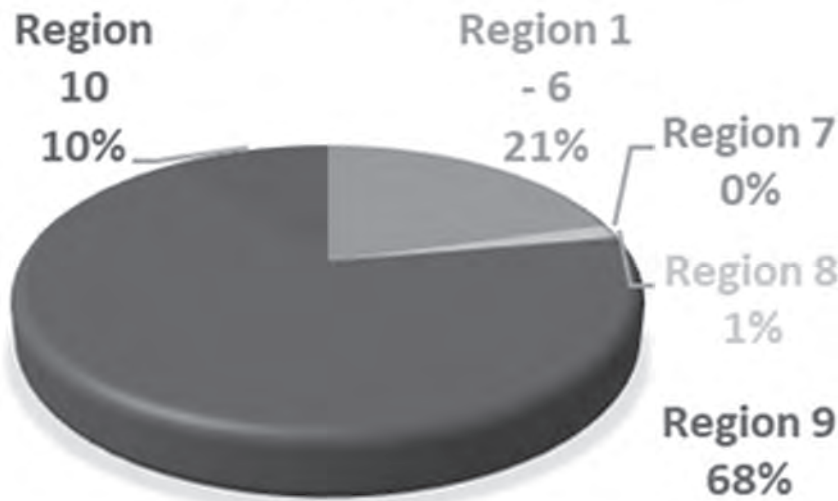
Field Work

The program looks to further encourage and inspire the young mind's fascination with electronics, programming, and robots while fostering childhood creativity and incorporating basic lessons in electrical engineering, circuit assembly and programming in a play like, yet highly didactical atmosphere. Our human fascination with technology and robots is rooted upon early exposure to scientific concepts (trial and error) as children, and exposure to technology (toys) and tv shows about robotics [5]. The results that are presented in this article are primarily based on 25 of our most active groups around the world that are affiliated with EDS-ETC, achieving the instruction of about 25,000 students since 2010, the

year the program was started. Covering many ethnicities, cultures, economic backgrounds and languages, yet united in the inquisitiveness and curiosity to understand our world, epitomizing the true foundation of science and engineering. For the last 26 months, the program has involved 10,532 students out of which 51% are male and 49% are female, offering a true equal gender opportunity while empowering many under resourced communities in typical 60-90-minute sessions. Currently there are teaching guides available in a variety of languages that allows the volunteer instructors to make a larger and longer lasting impact on their students.

In today's world, current humanitarian advances and future technologies are being achieved by giving crucial knowledge to students so that they learn first-hand what they can create by becoming engineers and making the career path much less intimidating. The program increases substantially the percentage of

REGIONAL ACTIVITIES



Percentage of activities by region in the last two years (2016–2017) (c) 2018 IEEE

students that decide to study engineering around the world. The EDS-ETC program provides at no additional cost the kits to any IEEE-EDS chapters that request them with the agreement that they will compile reports using a simple web link [6].

Currently some chapters have developed very strong relationships with their local communities and teachers. In some cases the training sessions have been extended to up to 8 classroom periods, giving significant value added to the program while providing results that have a positive societal impact. According to reported results and studies conducted demonstrating that combining electrical engineering content with programming uses knowledge of; elementary math, algebra, physics, and many additional concepts making it a multidisciplinary exercise that benefits both the students and the instructors [7] In 2017, IEEE-EDS Colombia hosted a “hackathon” where the IEEE student community and EDS student chapters searched for practical solutions to develop an inexpensive early detection alarm system that could provide warning to the surrounding communities assisting in the event of emergencies and natural disasters [8].

Results

The reports received by EDS clearly show that the program is becoming more popular, mainly in regions 9 (Latin America) and 10 (Asia) where alliances have been formed with key institutions and local governments, especially in the Latin American countries as well as the Caribbean basin. This has resulted in improvements regarding public policies for different communities integrating the benefits of the program with the local schools, generating longer hours of learning and creating a donation fund to increase the number of kits of which the schools have access. The program has reported results that demonstrate an improvement in math skills while familiarizing students with technological development[9], noticed by school administrators regarding test scores and better use of technology that is available to the community.

It is worth recognizing the success and format used by the student Branch of the Universidad de Santo Tomas in Tunja, Colombia where they empowered rural teachers in the region by training them. Once trained, they created a spreadsheet where they organized the rotation of the existing kits, lending them each week to a different school

and increasing the utilization despite having only a small number of units. This increased the number of events and students served at a record rate as clearly demonstrated in figure 1.

Format

Reviewing the surveys completed at the end of every event, it is evident that the kits are having a positive impact because the children involved believe that they are playing while they are really learning valuable skills. Children learn by doing, they discover, learn and develop their own knowledge based on the activities and guidance provided by the instructor [10] [11]. Thanks to the intuitive design of the task of connecting the circuit components, the troubleshooting required in some instances to make the circuits work, creating the projects becomes a fun activity that makes it easy to introduce the basics of electrical engineering such as; the meaning of resistance, voltage, current, series/parallel circuits and including motor function, LEDs, photo cells, resistance, capacitance. For the advanced kits; solar cells, radio components with an oscilloscope application through the microphone input of a laptop to easily visualize frequencies, and amplitudes of waveforms and even enabling frequency domain Fast Fourier Transforms (FFT) in real time.

Because of the advancement of the EDS-ETC program in Colombia a “hackathon” was hosted in which 16 student chapters participated with the goal of generating early detection alarms for emergencies and natural disasters in each chapter’s respective region. The most impressive project involved the creation of an inexpensive circuit and mobile application connected to the local authorities and population alerts in the event of flooding or mudslides via their cell phones. This “hackathon” was the first of many events which will be repeated at a regional level during the 2018 year. Program participants will include finalists of participating high schools that are involved in the EDS-ETC initiative.

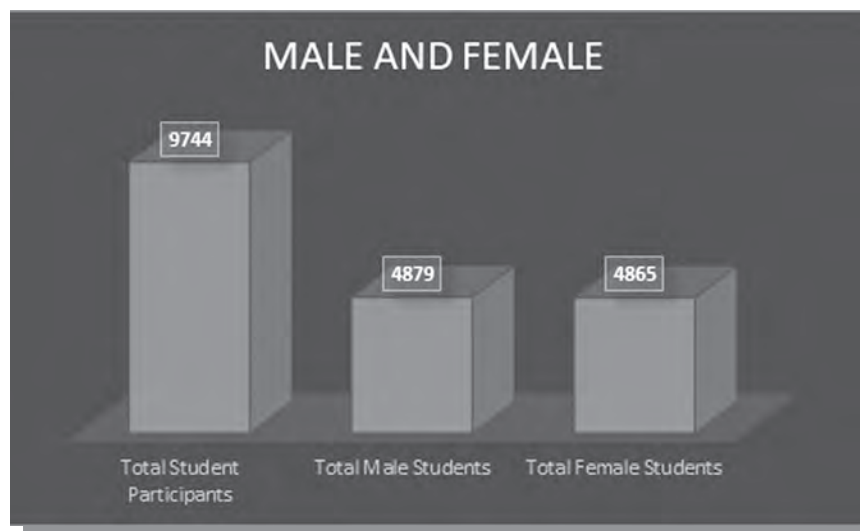
It is worth noting the results achieved by the chapters in Kuala Lumpur, Malaysia [12], and Coimbatore India in region 10 since the above-mentioned regions are involving the participation of girls making their success even more noteworthy for the engineering field and strengthening alliances with affinity groups such as Women in Engineering (WIE) involving more than 450 girls over the last 2 years, hopefully increasing the number of future female engineers in the region.

In addition to these best practices, it is necessary to develop lesson plans and guides with questions and theoretical concepts that reinforce knowledge in children, thus generating a record and activating their long-term memory, these have been shared and are available through the IEEE's Collabratec Community [13].

In order to provide path to higher levels of knowledge for those children with high interest the EDS-ETC. program has begun to offer additional devices such as Arduino® and Raspberry-pi® which require a more advanced level of electronics, but which satisfy higher level needs and help with the teaching of programming principles, which also opens multiple possibilities where each community can identify, plan and develop projects with social impact in their local environment, it is important to maintain a dynamic where both the needs of the instructors and the students are integrated, thus avoiding many of the mistakes of the techniques of teaching of previous initiatives, where the methodologies to develop the systems of Learning were not designed with strong foundations on the educational point of view, and [14] the development of most systems left out the needs of students and instructors [15].

Conclusion

The positive and immediate feedback that the EDS-ETC program provides to young people has proven to be a powerful tool to encourage the study of science, engineering, program-



Number of men vs. women trained for the program during 2016 to 2017 (c) 2018 IEEE

ming and mathematics. With the added value of increasing self-esteem and assessment of the fundamentals of technology that impacts the total society in all regions of the world. Children are the future and it is the key to stimulate their natural curiosity and show the way to solve the great challenges they will face in the world that awaits them.

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Quevedo, Luis Miguel was born in Bogota, Colombia, in 1987. He received his B.S. and M.S. degrees in mechatronic engineering from the

University of San Buenaventura, Bogota, in 2015 and the specialization degree in business and services of

telecommunications from the same University, in 2016.

In 2015, he founded JWG S.A.S a company implementing automation solutions in Colombia for companies including: General Motors, Andina, Quala S.A., and PEPSICO. He has led the EDS-ETC program since 2017. His interests include Internet of Things, STEM, factory automation, nanoparticles, and innovation on sensorless control. He is a

member of committee of student activities in the IEEE Colombia Section.

Mr. Quevedo was a recipient of the Industry Applications Society Award outstanding student branch chapter in 2013, Honorable mention of University of San Buenaventura to the effort, development and leadership skills during the B.S. in 2015. *Reprinted with permission from the 2018 IEEE Integrated STEM Education Conference (ISEC)*



Fernando Guarin and Luis Miguel Quevedo, instructing educators on the use of the Elenco Snap Circuits kits and how they are utilized in the EDS-ETC program

SAVE THE DATE

The Electron Devices Society's flagship annual conference, the IEEE International Electron Devices Meeting (IEDM) will be held December 1–5, 2018, at the Hilton San Francisco Union Square Hotel in San Francisco, California, USA.

The IEDM is the world's pre-eminent forum for reporting technological breakthroughs in semiconductor and electron device technology, design, manufacturing, physics, and modeling, with strong representation from speakers and attendees from around the globe.



Its scope encompasses silicon and compound semiconductor technology and devices, 2D and emerging material systems, and features topics such as nanometer-scale CMOS technology, advanced memory, neuromorphic computing, 5G and THz devices. Also, optoelectronics, displays, sensors, novel quantum and nano-scale devices and phenomenology, devices for power electronics and energy harvesting, as well as process technology and device modeling and simulation.

For more information, see <https://ieee-iedm.org/>

UPCOMING TECHNICAL MEETINGS

2018 SYMPOSIUM ON VLSI TECHNOLOGY

HONOLULU, HAWAII, USA

The 38th Annual Symposium on VLSI Technology will be held from June 18–22, 2018, at Hilton Hawaiian Village, Honolulu, Hawaii, USA. This symposium, co-sponsored by the IEEE Electron Devices Society (EDS) in cooperation with the IEEE Solid-State Circuits Society (SSCS) and the Japan Society of Applied Physics, 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 and have a fully overlapping schedule to promote interactions between technologists and circuit/system designers. This year, the theme for both Symposia is **"Technology, Circuits and Systems for Smart Living"**. It reflects tight interactions between R&D in all three areas required to achieve continuous improvement in performance, power reduction and cost. 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 on "Heterogeneous System Integration", "New devices and Systems for AI", "Power Devices and Circuits" and "Design and Technology Co-Optimization in Advanced CMOS Technology". Moreover, the 2018 Symposium on VLSI Technology features **technology focus sessions** on "BEOL Integration and Technology for Power and Thermal Management" and "Sensors and related devices for IoT, Medicine and Smart Living".



The Friday full day Forum Session initiated successfully last year will be dedicated to **"Machine Learning Today and Tomorrow: Technology, Circuits and System View"**. Several experts in the field will steer discussion on how technology and circuits will drive the future of AI/ML.

Additional highlights include:

- **Plenary sessions Technology and Circuits** with 4 talks:
 - Scott J. DeBoer, Micron Technology, "Memory Technology: The Core to enable Future Computing Systems";
 - Prof. Satoru Miyano, University of Tokyo "Revolutionizing Cancer Genomic Medicine by AI and Supercomputer with Big Data";
 - Bill Dally, Nvidia, "Hardware-Enabled Artificial Intelligence";
 - Tsuneo Komatsuzaki, SECOM, "IT Technology-Enabled Secure Social System"
- **Three Evening Panel Discussions:**
 - "Is the CPU Dying or Dead?"

- "Storage Class Memories: Who cares? DRAM is Scaling fine, NAND is Stacking Great"
- "The Next Big Thing after Smartphone"
- **Full-day short course.** The attendees will get opportunity to learn about recent trends and challenges in advanced microelectronics technology, its adaptation into new computing systems, cloud storage, wearable devices and healthcare products.
- **"Device and Integration Technologies for sub-5nm CMOS and Next Wave of Computing"** (Technology)
 - Beyond 5 nm node CMOS Technology
 - MOL/BEOL Interconnects
 - Atomic Level Analysis for FINFET and Nanowire Design
 - 3D Integration for Image Sensors
 - Beyond CMOS devices
 - Neuromorphic AI hardware
 - Memory Technologies for AI/ML

- Sensors/Analog Devices for Next Wave of Computing

Two **satellite workshops** will be held before the technical session of the symposium: "IEEE Silicon Nanoelectronics Workshop" (June 17th and 18th) and "Spintronics Workshop on LSI" (June 17th) at the same location.

There will be also Joint EDS/SSCS sponsored events to support network-

ing for **Women in Engineering** and mentoring for **Young Professionals**.

We cordially invite you to attend the 2018 Symposium on VLSI Technology. For further information please visit the VLSI Symposia website: <http://www.vlsisymposium.org>.

Mukesh Khare (USA)
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Applied Materials

Yamakawa Shinya (Japan)
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Sony Semiconductor Solutions

2018 IEEE INTERNATIONAL SYMPOSIUM ON SEMICONDUCTOR DEVICES AND ICs (ISPSD)

It is our pleasure to invite you to attend the 30th Annual International Symposium on Semiconductor Devices and ICs (ISPSD) that will be held May 13-18, 2018 in Chicago, Illinois, USA. ISPSD is the world's premier forum for technical discussions in all areas of power semiconductor devices and power integrated circuits that bring together over 400 attendees and exhibitors from all fields related to power semiconductors. Since its first meeting in Japan in 1988, ISPSD has made critical contributions to the growth of the global power semiconductor industry. Over the past 3 decades, ISPSD has enabled energy-efficient power electronic applications such as solar power, wind power, electric vehicles, data centers, and industrial drives. Most of the breakthrough power device technologies were first reported and presented at ISPSD conferences before they became large commercial successes. Come join us as ISPSD 2018 will celebrate 30 years of excellence in advancing power semiconductor technologies with a series of technical and social events.

Full Day Short Course

On Sunday May 13th, ISPSD will hold a full day short course that is an excellent opportunity for all students and

engineers to take an in-depth look at current and emerging topics in power semiconductor and related areas. All subjects are taught by an expert in their field. This year we will have short course topics including "AlGaIn/GaN Device Reliability," "Vertical GaN Devices," "SiC Design and Fabrication," "Charge Balance Si Power Devices," "Loss Mechanisms in Si and WBG Power Devices," and "Multichip Power Module Design and Assembly."

Technical Sessions

The main technical sessions of ISPSD are filled with industry and academic experts giving a series of plenary talks and over 45 oral and 75 poster presentations. Highlights from key upcoming sessions and focus areas include:

Plenary Talks from Industry Experts:

- "ISPSD: A 30 Year Journey in Advancing Power Semiconductor Technology" Dr. Leo Lorentz (ECPE)
- "Silicon, GaN and SiC: There's Room for All" by Larry Spaziani (GaN Systems)

Superjunction MOS, Diodes and IGBTs:

The sessions on Si MOS and IGBTs include 8 talks over 2 days with top-

ics including superior switching IGBT designs (Infineon), 6.5 kV IGBT design (ABB), IGBT characterization (Infineon) as well as advanced Superjunction MOSFET design and concept talks (Toshiba). Additional presentations on advanced 1200 V IGBTs will be given by ABB, Toyota Motor Corp., and Toshiba).

SiC Power Devices:

The first SiC session will focus on state of the art SiC MOSFETs (Denso, Panasonic) followed by several talks by Infineon, TU Dortmund University, and Hestia Power focus on threshold stability and reliability of SiC devices. The second sessions will be focused on SiC reliability and ruggedness including papers on short circuit performance, body diode reliability, and modeling (Hitachi, University of Naples, Mitsubishi, and ABB).

GaN Power Devices:

With the increased interest in WBG devices, GaN presentations will have at least 7 talks over 2 full sessions from research institutions including the University of Padova, Zhejiang University and The Hong Kong University of Science and Technology. Topics range from device optimization to reliability and characterization.

ISPSD 2018



CHICAGO, USA

The IEEE International Symposium on
Power Semiconductor Devices and ICs

Palmer House Hilton

May 13-18, 2018

www.ISPSD2018.com

Celebrating **30 YEARS** of Excellence in Advancing Power Semiconductor Technologies

Smart Power ICs:

Complementary to the GaN session, this session is focused on novel gate driver and monolithic integrated drive methods for power GaN transistors. GaN IC talks will be given by The Hong Kong University of Science and Technology, Southeast University, and the University of Toronto.

Packaging and Enabling Technologies:

Critical to power semiconductor performance is the package and module technologies. In this session we will have 5 talks on topics such as 3.3kV SiC power modules from Hitachi and the University of Nottingham. Other talks on GaN, SiC, and packaging from Chemnitz University, Fuji Electric, and the University of Nottingham.

Si Reliability:

To complete the comprehensive conference agenda, a session on lateral power device reliability will contain 4 talks with topics ranging from LD-MOS devices (Southeast University, UESTC) to power device interconnects (Texas Instruments), and high voltage FinFETs (Indian Institute of Science).

Vendor Exhibits:

In addition to the technical sessions, the conference will host Industrial exhibitions from key vendors and suppliers in the power semiconductor community. This is a tremendous opportunity to meet and learn about new products, tools, and resources available to the engineers and managers working in the power semiconductor field.

Venue and Activities:

ISPSD 2018 will be held in the historical **Palmer House Hilton Hotel** in the beautiful downtown district of Chicago. There are numerous museums, parks, theatres, restaurants, and shops within walking distance. As an added chance to network with fellow technologists there will be a special social event to celebrate ISPSD's 30th anniversary that will include an Induction of ISPSD Hall of Fame and "Ask a Founder" interviews. For those traveling with attendees, companion tours and social programs will be available (Chicago architecture tours, Chicago dining tours, etc.).

Chicago is the third largest city in the United States with non-stop

flights connecting to most major cities in Asia, Europe, and North America. This great city is an international hub for finance, commerce, industry, technology, telecommunications, and transportation. Chicago is the headquarters to 12 Fortune 500 companies and has major automotive OEMs and suppliers. Industrial equipment manufacturers within 300-mile radius include: Ford, GM, Chrysler, Delphi, Rockwell, Eaton, Johnson Control, Caterpillar, and Cummings. The city of Chicago is the birthplace of modern skyscrapers and a living museum of modern architecture. We trust you and your family will enjoy your stay in Chicago!

Find more information and full technical program at: www.ispsd2018.com

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Illinois Institute of Technology
Chicago, IL, USA

SOCIETY NEWS

MESSAGE FROM EDS PRESIDENT

Dear EDS Colleagues:



Fernando Guarin
EDS President
(2018–2019)

It is my distinct honor and privilege to serve the Electron Devices Society as your 2018–2019 President. I would like to express our sincere gratitude to the Past President

Samar Saha for his stewardship and numerous accomplishments during his tenure. The efforts of many dedicated volunteers have positioned EDS on solid ground in the technical and financial areas.

As a volunteer-led, volunteer-driven organization, we rely on the dedication of individuals like you to share their time, talent, and energy to help make EDS the premier global society devoted to advancing the field of electron devices for the benefit of humanity. As a member of our Society, we invite you to play a vital role in this effort.

Member Recognition. Our members do important work, impacting nearly every facet of life around the world. Recognizing the accomplishments of EDS members is a vital part of why we choose to be a part of the society. Being a financially healthy society, we give out more than \$35,000.00 in awards every year.

EDS Mission Fund. Thanks to generous donors, EDS is able to expand our assistance to students studying the field of electron devices and our worldwide K-12 educational outreach program, EDS-ETC, which inspires young students to explore a field in engineering. More information on EDS Student Fellowships and EDS-ETC can be found on our website.

Committee Appointments. EDS has a host of standing and technical committees that are important venues for members to become more engaged in the working of the society. These committees are a wonderful opportunity for EDS members to meet colleagues with similar interests and build the types of personal and professional networks that are the lifeblood of our individual careers and the industry as a whole.

Chapter Activities. Thanks to the efforts of our volunteer leaders and efficient and enthusiastic staff, EDS now has more than 200 chapters around the world. Keeping this family close-knit and vibrant provides significant opportunities for networking on a local level. To help connect to the EDS members nearest to you, you can find your local EDS chapter on our global chapters map. We strongly encourage you to join a local EDS chapter.

Technical Meetings. The benefits you can derive from membership in the Society can be greatly enhanced by attending the many conferences, workshops and symposia supported by the EDS. By becoming a member, you will be able to attend these conferences at the lower member rate. We hope you will be able to take advantage of these meetings as a means of staying current with our fast moving technology.

Education and Training. An important part of our member benefit package is education and training. This year we plan to invest approximately \$100,000 to support our Distinguished Lecturer and Mini-colloquia programs as a reach out to our members worldwide.

Publications. As an EDS member, you have free on-line access through

IEEE Xplore® to four publications, which include our Society's new offering, the *IEEE Journal on Photovoltaics*, as well as *Transactions on Electron Devices* (1954 to current), *Electron Device Letters* (1980 to current), and the *Journal of Lightwave Technology*. Free online access will also be available through IEEE Xplore® to the entire collection of the IEEE International Electron Devices Meeting (IEDM) technical digests from 1955 to current. Consider publishing in our open access journal, the *IEEE Journal of the Electron Devices Society*. This new journal provides authors an affordable outlet for rapid publishing and universal access.

Webinars. Members-only content such as webinars and tutorials with engineering luminaries like Chenming Hu, leader of the UC Berkeley team that created the FinFET 3D Transistor, and Table of Content email alerts delivered right to your inbox.

Think global, act global. For EDS to be a truly global society we must be prepared to meet wherever our members are. With more than 10,000 members and over 200 chapters on six continents, that can be just about anywhere. The vitality and future of the Electron Devices Society depends upon the talent and active participation of all its members. Again, we welcome you to the Electron Devices Society. If you have any questions or concerns, please do not hesitate to contact either one of us or our Executive Office.

Fernando Guarin
EDS President
GlobalFoundries
Hopewell Junction, NY, USA

MESSAGE FROM THE EDITOR-IN-CHIEF

Dear EDS Members and Readers,



Carmen M. Lilley
Editor-in-Chief

Welcome to the April newsletter. For this newsletter, you will find articles of EDS events and activities throughout the globe that highlight the breadth of activities and outreach of EDS members. In addition, I would like to welcome two new members have joined our Editorial team; Mike Schwarz from Robert Bosch GmbH, and Marcin Janicki, from Lodz University of Technology. These two new volunteers will be responsible for promoting EDS activities in Region 8, Western and Eastern European countries, respectively.



Mike Schwarz received the Diploma degree from the University of Applied Sciences Giessen-Friedberg, Giessen, Germany, in 2008 and the M.S. degree in electrical engineering from the Universitat Rovira i Virgili, Tarragona, Spain, in 2009. During 2008–2013, he was Research Assistant—Ph.D. student at Device Modeling Research Group, NanoP, Technische Hochschule Mittelhessen, Giessen, Germany. He received his Ph.D. degree with honors

from the Universitat Rovira i Virgili in October 2012 on the subject of compact modeling of Schottky barrier multiple-gate FETs. Mike was the recipient of the Friedrich Dessauer Prize for the best diploma thesis about multiclass support vector machines in 2008 and the URV Graduated Student Meeting on Electronic Engineering Award for the best oral presentation for a paper about an analytical model for the electric field in Schottky barrier double-gate MOSFETs in 2010.

Since 2013 he is with the Robert Bosch GmbH, working in the R&D department on design, layout, modeling and process and device simulation of MEMS sensors and systems. Since 2016 he is leader of the diode design in the MEMS R&D department. His current research interests are simulation and compact modeling of Schottky Barrier MOSFET devices and simulation and compact modeling of neuromorphic applications. He is member of the scientific committee of MIXDES conference. He is member of the NanoP, Giessen, Germany, and an IEEE Fellow.



Marcin Janicki was born in 1970 in Lodz, Poland. From the very beginning of his scientific career, he is associated with the Lodz Uni-

versity of Technology, from where he obtained his academic degrees (MSc 1994, PhD 1999, DSc 2012). Currently, he is employed as an associated professor in the Department of Microelectronic and Computer Science.

He was the beneficiary of numerous long-term scholarships and fellowships (scholarship of the French government, NATO post-doc Advanced Fellowship, FWF Lise Meitner post-doc program), owing to which he carried out research at several European universities and research institutes (École Nationale Supérieure d'Électricité et Mécanique, Nancy, France, University of Strathclyde, Glasgow, Scotland, University of Ghent, Belgium, Radon Institute of Austrian Academy of Sciences, Linz, Austria).

His main research interests encompass thermal and electro-thermal modeling of electronic systems, modeling of silicon carbide power devices, multi-physics simulation of SoC ICs and integrated sensors, VLSI technology, advanced optimization and estimation methods with special consideration of inverse problem algorithms, infrared thermography and its applications in medicine. Altogether, he coauthored 180 scientific publications, including 25 papers in journals from the JCR database.

Carmen M. Lilley
Editor-in-Chief, EDS Newsletter
Email: clilley@uic.edu

ANNOUNCEMENT OF NEWLY ELECTED BOG MEMBERS

The EDS Officers and Board of Governors members-at-large election was held on December 3, 2017 in San Francisco, California. I am pleased to present the results of this election and short bios of the upcoming team that will lead EDS in years to come.

Officers

The following volunteers were elected as Officers beginning January 1, 2018:

President-Elect

Meyya Meyyappan is Chief Scientist for Exploration Technology at NASA Ames



Research Center in Silicon Valley. His research interests include electronics beyond Moore's Law, printed electronics, chem, bio

and radiation sensors, nano optoelectronics and advanced flight instrumentation. He has over 375 peer-reviewed journal publications and given over 250 Plenary/Keynote/Invited Talks across the world. He is a Fellow of IEEE, MRS, ECS, AVS, IOP, ASME, AIChE and National Academy of Inventors. He has received numerous awards for his contributions to Nanotechnology including a Presidential Meritorious Award, NASA Outstanding Leadership Medal, IEEE-USA Harry Diamond Award, IEEE Judith Resnick Award, IEEE NTC Nanotechnology Pioneer Award, AVS Nanotechnology Recognition Award, AIChE Nanoscale Science and Engineering Forum Award, and honorary degrees from the University of Witwatersrand in South Africa and Concordia University in Montreal. He was inducted into the Silicon Valley Engineering Council Hall of Fame in 2009.

Treasurer



Subramanian S. Iyer (Subu) is Distinguished Professor and holds the Charles P. Reames Endowed Chair in the Electrical Engineering Department

at the University of California at Los Angeles, and is Director of the Center for Heterogeneous Integration and Performance Scaling (CHIPS). Prior to that, he was an IBM Fellow. His key technical contributions have been the development of the world's first SiGe base HBT, Salicide, electrical Fuses, embedded DRAM and 45nm technology node used to make the first generation of truly low power portable devices. He also was among the first to commercialize bonded SOI for CMOS applications through a start-up called SiBond LLC. He has published over 300 papers and holds over 70 patents. He was a Master Inventor at IBM. His current technical interests and work lie in the area of advanced packaging constructs for system-level scaling and new integration

and computing paradigms as well as the long-term semiconductor and packaging roadmap for logic, memory and other devices. He has received several outstanding technical achievements and corporate awards at IBM. He is an IEEE Fellow, an APS Fellow and a Distinguished Lecturer of the IEEE EDS and EPS as well as it treasurer of EDS and a member of the Board of Governors of IEEE EPS. He is also a Fellow of the National Academy of Inventors. He is a Distinguished Alumnus of IIT Bombay and received the IEEE Daniel Noble Medal for emerging technologies in 2012.

Secretary



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 pos-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, 1988–2013, as Full Professor. He served as director of the Center for Semiconductor Components, 1998–2005 and as Director of CTI, 2007–2011. He retired from UNICAMP in mid-2013, when he assumed a volunteer collaborator professor position. He is currently imec representative in Brazil. He is ranked as fellow researcher, level 1A (highest), at CNPq and is a Fellow of IEEE, of the São Paulo State Academy of Science and of the National Engineering Academy in Brazil. He is since 2001 the leader of a large research network in Brazil, called NAMITEC.

BoG Members-at-Large

A total of eight members were elected for a three-year term (2018–2020).

Three of the eight electees are serving a second term, while the other five have joined the board for the first time. The backgrounds of the electees span a wide range of professional and technical interests. The following are the results of the election and brief biographies of the individuals elected.

Second Term Electees:



Mukta Farooq is a metallurgist/materials scientist, with expertise in 3-Dimensional silicon integration/packaging, die/wafer stacking for hybrid

memory cube, CMOS FET back end structures, C4 technology, lead-free alloys and chip package interaction.

Mukta is an IBM Lifetime Master Inventor with over 175 issued US and international patents. She has 27 external publications, and has given invited talks at conferences and universities. She is a founding member of the annual IBM Semiconductor Technology Symposium, having served as Technical and General Chair. Mukta is a Senior Member of IEEE, an IEEE EDS Distinguished Lecturer, Chair of the EDS Mid-Hudson Chapter, and Regional Editor, EDS Newsletter.

Mukta is a Senior Technical Staff Member at IBM, and a member of the IBM Academy of Technology. She has a B.Tech. in Metallurgical Engineering from IIT-Bombay, an M.S. in Materials Science from Northwestern University and a Ph.D. in Materials Science & Engineering from Rensselaer Polytechnic Institute.



Carmen M. Lilley received her Bachelors of Engineering in General Engineering from the University of Illinois at Urbana Champaign in 1998 and her Ph.D. in Theoretical and

Applied Mechanics from Northwestern University in 2003. She is an Associate Professor in MIE and Adjunct Associate Professor in Electrical and Computer Engineering. Her research is focused on modeling and characterization of low dimensional nanomaterials (0D, 1D, and 2D) and self assemblies of nanomaterials on Si. Dr. Lilley has published in highly respected journals and conferences, including Applied Physics Letters, Journal of Applied Physics, Nano Letters, ASME Journal of Applied Mechanics, and IEEE Transactions in Nanotechnology. Dr. Lilley has also received various awards and honors recognizing academic and research achievements including the NSF CAREER award in 2009.



Durga Misra is a Professor in the Electrical and Computer Engineering Department of New Jersey Institute of Technology (NJIT). He received his

M.S. and Ph.D. degrees both in Electrical Engineering from University of Waterloo, Waterloo, Canada, in 1985 and 1988 respectively. His current research focus is study of nanoscale CMOS gate stacks with high-k gate dielectrics and its reliability. He served as the IEEE EDS SRC Chair for North America (2006–2012) and received IEEE MGA's International Leadership Award. He is currently a Distinguished Lecturer of EDS. He is a Fellow of the Electrochemical Society (ECS) and has received the Electronic and Photonic Division Award and the Thomas D. Callinan Award from the ECS. He has edited and co-edited more than 30 conference proceedings including several of them on High-k gate stacks. He has published more than 200 articles in journals and international conferences.

First-Time Electees:

Roger Booth received a Ph.D. in Electrical Engineering from Michigan State



University, and is a Senior Member of IEEE. He currently works for Qualcomm, and his career has included time at IBM, Tower-Jazz and Booz Allen Hamilton (at DARPA). He has spent most of his career working on RF/Analog CMOS processes, but has experience with SOI, SiGe, and high power RF processes.



Edmundo A. Gutiérrez has published more than 130 papers and international conferences in the field of semiconductor device physics, modeling, simulation, sensors, and circuits.

He is author of the books *"Low Temperature Electronics, Physics, Devices, Circuits and Applications"* (Academic Press, 2000), and *"Nano-Scaled Semiconductor Devices, Physics, Modeling, Characterisation, and Societal Impact"* (The IET Press, 2016). Prof. Gutierrez has supervised 6 M.Sc. and 13 PhD theses. He received his Ph.D. on Applied Sciences from The Catholic University of Leuven (KUL), Belgium, where he also spent 6 years as a research assistant at the Interuniversity MicroElectronics Center (IMEC) in the Advanced Silicon Processing Division.

He has been invited Professor at Simon Fraser University (Vancouver, Canada), University of Sao Paulo (Brazil), and the Technical University of Vienna, (Austria). From 2000 to 2002 was the Design Manager of the Motorola Mexico Center for Semiconductor Technology, and from 2005 to 2007 Research Manager of the Intel Mexico Research Center. Currently Prof. Gutierrez is with the Department of Electronics of the National Institute of Astrophysics, Optics and Electronics (INAOE) in Puebla, Mexico. Prof. Gutiérrez is member of the National Systems of Researchers (SNI level 2) of Mexico, and member of different

Review Committees of the Mexico National Council of Science and Technology (CONACyT). Currently Prof. Gutiérrez is President of the Puebla EDS Chapter, President of the IEEE Puebla Section, member of the IEEE EDS Region 9 Outstanding Student Paper Award Committee, and Associate Editor of Electron Device Letters.



Benjamin Iñiguez obtained the B. S., M. Sc. and the Ph.D. in Physics in 1992, 1993 and 1996, respectively, from the Universitat de les Illes Balears (UIB),

Spain. From February 1997 to September 1998 he was working as a Postdoctoral Researcher at the Rensselaer Polytechnic Institute in Troy (NY, USA). From September 1998 to January 2001, he was working as a Postdoctoral Scientist in the Université catholique de Louvain (Louvain-la-Neuve, Belgium), supported by two Marie Curie Fellowships from the European Commission. In February 2001, he joined the Department of Electronic, Electrical and Automatic Control Engineering (DEEEiA) of the Universitat Rovira i Virgili (URV, Tarragona) as an Titular Professor, and in February 2010 he became Full Professor at the same university. He obtained the Distinction from the Generalitat for the Promotion of University Research in 2004 and the ICREA Academia Award (from ICREA Institute in Catalonia, Spain) in 2009 and 2014. He has published more than 120 research papers in international journals and more than 100 papers in proceedings of conferences. He has led one European Unión-funded project about compact modeling of nanoelectronic devices and is currently leading one Project about compact modeling of Thin-Film Transistors (TFTs). He has participated as URV team leader in five more European Unión-funded projects and in two research contracts with Silvaco Inc.

He is IEEE Senior Member since 2003 and Distinguished Lecturer since 2004. He has been Vice-Chair of EDS Region 8. Since August 2016, he is Associate Editor of *IEEE Transactions on Electron Devices*, and since January 2017 he is the Chair of the Compact Modeling Technical Committee of EDS. In December 2017 he was elected EDS BoG Member at Large.

His current research interests are compact modeling of advanced electron devices (in particular MOS structures, GaN HEMTs and TFTs), parameter extraction techniques and semiconductor device physics and electrical characterization.



Manoj Saxena received M. Sc., and Ph.D. degrees in Electronics from University of Delhi, New Delhi, in 2000 and 2006 respectively. He is currently Associate Professor in Department of Electronics, Deen Dayal Upadhyaya College, University of Del-

hi, New Delhi, India. He has authored or coauthored 250 technical papers in international journals and conferences (including 70 papers in TED, TDMR, TNANO, EDL and IEEE conference proceedings). He received "Highly Valued Volunteer for 2011–2012 EDS Chapters in South Asia, IEEE Region 10" and has reviewed extensively for TED, EDL, SST, SSE and JAP: D Applied Physics. He was Young Associate of Indian Academy of Sciences, Bangalore (India) and Vice Chair—IEEE EDS SRC Region 10 (2016–2017). Currently he is EDS Distinguished Lecturer; Regional Editor IEEE EDS Newsletter—Region 10 South Asia; Senior Member-IEEE; Fellow-IETE (India), Member of—IOP (UK), IET (UK) and National Academy of Sciences India (NASI).



Sumant Sood is an electrical engineer with expertise in MEMS packaging, wafer bonding for 3D-ICs as well as SOI & Advanced engineered sub-

strates development. As a Hardware Engineering Team Lead at Apple, Sumant is responsible for development of cutting edge silicon and MEMS solutions. Prior to Apple, he spent more than 12 years in product engineering positions at KLA-Tencor, SUSS Micro-Tec and Belford Research Inc. Mr. Sood has authored and co-authored more 50 publications in the areas of wafer bonding, MEMS and advanced packaging and several issued pending patents in these areas. He received his B.Tech in Electrical Engineering from Punjab University and MS in Microelectronics from University of Central Florida.

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
2017 EDS Nominations and
Elections Chair
University of California
Riverside, CA, USA

AWARDS & RECOGNITION

2018 IEEE EDS ROBERT BOSCH MICRO AND NANO ELECTRO MECHANICAL SYSTEMS AWARD WINNER

The 2018 IEEE EDS Robert Bosch Micro and Nano Electro Mechanical Systems Award was presented to Professor Pasqualina M. Sarro, Delft University of Technology, Delft, The Netherlands, at the 2018 IEEE International MEMS Conference in Belfast, Northern Ireland during January 2018. This prestigious award recognizes and honors advances in the invention, design, and/or fabrication of micro- or nano-electromechanical systems and/or devices.

Prof. Pasqualina (Lina) M. Sarro received the Laurea degree in Physics (magna cum laude) with specialization in Solid-State Physics, from the University of Naples, Italy, in 1980. From 1979 till 1981 she was a research assistant associated with Professor F.P. Califano in the Semiconductor Devices Group of the Department of Electrical Engineering, working on new low cost fabrication techniques for silicon solar cells

and thin film solar cells. From 1981 to 1983, she was a post-doctoral fellow associated with Professor J. J. Loferski in the Photovoltaic Research Group of the Division of Engineering, Brown University, Rhode Island, U.S.A. where she worked on thin-film photovoltaic cell fabrication by chemical spray pyrolysis. In October 1983, she joined the Electronic Instrumentation Laboratory of the Delft University of Technology, Delft, The

Netherlands as a research assistant associated with Professor S. Middelhoek, working on infrared sensors based on integrated silicon thermopiles fabricated by IC technology and silicon micromachining. On October 1, 1987, she received the Ph.D. degree in Electrical Engineering and then joined the Delft Institute of Microsystems and Nanoelectronics (DIMES) leading research on integrated silicon sensor and MEMS technology, electronic material processing and novel microstructures. In December 2001, she was appointed A. van Leeuwenhoek Professor in Microsystems Technology. Since 2014, she is the Head of the Electronic Components, Technology and Materials (ECTM) Laboratory at the Delft University of Technology. From October 2009 to March 2016, she was the Microelectronic Department Chair. She has authored and co-authored more than 500 journal and conference papers and has supervised more than 50 PhD students.

She is an Associate Editor for the IEEE Journal of Microelectromechanical Systems and has been an Associate Editor (2006–2009) for the IEEE Sensors Journal. She is the recipient of the 2004 Eurosensors Fellow Award, The AISEM Career Award (2007), The IEEE 2012 Sensors Council Meritorious Award and co-recipient of the Rudolph Kingslake Medal (1997). Since 2006, she is an elected member of the Royal Netherlands Academy of Sciences (KNAW) and IEEE Fellow.

She acts as reviewer for a number of technical journals and is member of the International Steering Committee



Pasqualina M. Sarro

For pioneering contributions in novel materials, material integration and innovations in MEMS and strong commitment to education and technology transfer

for several international conferences (IEEE MEMS, IEEE Sensors, Eurosensors, Transducers). She was the Technical Program Chair for the first three IEEE Sensors Conferences (2002–2004) and the General co-chair of IEEE MEMS 2009 Conference, General co-chair for IEEE Sensors 2014 and European TPC Chair for Transducers 2015.

In addition, she is a frequent reviewer and assessor for national and international research programs. She is/has been member of the scientific advisory board of large research programs or organizations [Nano-Tera Program, Switzerland, 2008–2013; Network of Excellence General Olfaction and Sensing Projects on a European Level, 2004–2008; 'Fondazione Bruno Kessler', (FBK), Trento, Italy

(2013–2017)]; a reviewer for The Dutch Ministry of Economic Affairs; Belgium Technology Foundation, Italian Ministry for University & Research, ERC; Scientific Evaluators FunMat research Center, Sweden. She is/was also an independent board member of Sensor Integration bv (since April 2007) and of MELEXIS Microelectronic Integrated Systems (2005–2014).

Her main research interest is in novel materials and structures for MEMS and NEMS to be applied in health, environmental applications, automotive and scientific instrumentation.

*Richard Muller
2017 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, travel expenses to attend the award presentation, 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 2. Letters of recommendation must be sent directly to l.riello@ieee.org according to the same schedule.

2017 EDS DISTINGUISHED SERVICE AWARD



*Professor Paul
K.L. Yu*

The IEEE Electron Devices Society (EDS) is extremely proud of the services that it provides to its members. Its members generate the premier new developments in the field of electron

devices and share these results with their peers and the world at large by publishing their papers in EDS journals and presenting results in its meetings. This is a global activity that is effective because of the efforts of numerous volunteers. Many of these volunteers labor in relative obscurity, with their only reward being the satisfaction that they receive in being an important part of a successful organization, namely

of the IEEE Electron Devices Society. One means of thanking these volunteers is to recognize their contributions through the EDS Distinguished Service Award. The recipient of the 2017 EDS Distinguished Service Award was Professor Paul K.L. Yu of the University of California, San Diego, USA, and the award presentation took place at the International Electron Devices Meeting in San Francisco, CA on December 4, 2017. Professor Yu was unable to attend the presentation, but sent in his acceptance speech to be displayed at the IEDM plenary session.

Professor Paul K.L. Yu received his Ph.D. degree in Applied Physics from the California Institute of Technology in 1983. Since 1983, he has been a faculty member at the University of California, San Diego (UCSD) where

he is presently the inaugural holder of the William S.C. Chang Endowed Chair and a Distinguished Professor of Electrical and Computer Engineering, as well as the Provost of Revelle College at UCSD since 2014. His research focused on electron devices and materials for optical communications and renewable energy. He published in the area of microwave photonic device and contributed to the research advances in semiconductor waveguide modulator, photodetector, optical amplifier, and optoelectronic switch. In addition to investigating conventional semiconductor materials, including heterojunctions, quantum wells, and wide energy bandgap materials for device applications, he also studies advanced materials such as nanowires for photovoltaic and

electro-optic applications. He is a Fellow of IEEE, the Optical Society of America, the American Association for the Advancement of Science, and the Society of Photo-Optical Instrumentation Engineers.

Paul Yu has been a member of IEEE for 38 years. In 1992, he participated actively in revamping the activities of AP/ED/MTT chapter in San Diego, California. As a member of the leadership team of the IEEE Electron Devices Society (EDS), he served various roles such as Elected Member of the Board of Governors, Society Treasurer, Vice-President for Educational Activities, President (2012–2013), Awards Committee Chair, Fellow Evaluation Committee Chair, as well as an active

member of the EDS Celebrated Member Induction Committee (2012–2017). In the publication area, he served as an Editor of EDS Newsletter (1995–2000) and IEEE Electron Device Letters (2003–2011), and the Interim Editor-in-Chief of IEEE Transaction on Electron Devices (2015). In the areas of chapter and educational activities, he helped to establish the chapter partner program, chaired a subcommittee of Region and Chapters, revamped the EDS Distinguished Lecturer program for the benefit of chapter members. During his tenure as the EDS President, he vested the idea of a society flagship conference in Asia, and refreshed the governance structure of the society through a restructuring of

the EDS Executive Committee as well as a consistency review of the EDS Constitution and Bylaws. He also established the Robert Bosch MEMS & NEMS Award in EDS and moved the William H. Cherry Award from an EDS conference award to become an EDS society-level award.

Paul and his wife De De live in San Diego, California. They are the proud parents of Lea, a journalist and a technical writer, and Elton and Stephen, the twins who are computer engineers.

*Albert Wang
EDS Awards Chair
University of California
Riverside, CA, USA*

2017 EDS J.J. EBERS AWARD WINNER

The 2017 J.J. Ebers Award, the prestigious Electron Devices Society award for outstanding technical contributions to electron devices, was presented to Dr. Kang L. Wang of University of California, Los Angeles (UCLA), Los Angeles, California, at the IEEE International Electron Devices Meeting in San Francisco, California, December 3, 2017. This award recognizes Dr. Wang's "For contributions and leadership in strained SiGe and magnetic memory technologies."

Dr. Kang L. Wang is a Distinguished Professor and the Raytheon Endowed Chair Professor in Physical Science and Electronics at the University of California, Los Angeles (UCLA). He is affiliated with the Departments of Electrical and Computer Engineering, Materials Science and Engineering, and Physics. He received his BS degree from National Cheng Kung University (Taiwan) and his MS and PhD degrees from the Massachusetts Institute of Technology. He is a Member of Academia Sinica, Fellow of the IEEE, and Fel-



Dr. Kang L. Wang (right)

low of the American Physical Society. He was a Guggenheim Fellow. He also served as Editor-in-Chief of *IEEE TNANO*, editor of Artech House, Consulting Editor for Spins, and Associate Editor for Science Advances.

He demonstrated a Ge MOS transistor while he was at the General

Electric Research and Development Center at Schenectady, NY. In 1979, he joined UCLA and continued to work on strained SiGe and assessing its benefits for MOSFET, leading to industrial implementation of strained Si in CMOS technology after the 90 nm node.

In 2003, he worked with the joint team of a US Semiconductor industrial Consortium and DARPA on the Focus Research Centers Program (FCRP and now JUMP), in which he led the Center of FENA for 10 years, devoting to the development of nanoscale materials and devices for new architectures. The center's work led to the discovery of topological insulator and molecular switches. In 2005, he also led the Center of WIN, by working with the same Semiconductor Industrial Consortium together and NIST to establish Nanoelectronics Research Initiative (now nCORE) with the vision and

the quest for a new switch to resolve energy dissipation in scaled chips. He also led two DARPA programs in development of spin transfer torque memory and nonvolatile logic. He successfully improved the spin transfer torque (STT) write current and thus energy for industrial application, and at the same time, developed a new low energy voltage controlled Magnetoelectric magnetic memory or MeRAM. His work in the last two decades led to the successful integration of magnetic memory to CMOS IC technology. Recently, he and his students experimentally showed convincing evidence of

quantized signature of Majorana Fermion for potential topological quantum computing.

He and his wife, Edith, met and married at MIT where they pursued their Ph.D. studies. They have three children, Alexander, Benjamin and Evelyn who pursued computer engineering software, chemical & bioengineering, and mechanical engineering professions, respectively.

Yuan Taur

*2017 EDS J.J. Ebers Award Chair
University of California, San Diego
San Diego, CA, USA*

IEEE ELECTRON DEVICES SOCIETY J.J. EBERS AWARD CALL FOR NOMINATIONS



The IEEE Electron Devices Society invites the submission of nominations for the 2018 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 International Electron Devices Meeting (IEDM).

EDS J.J. Ebers Award on-line nomination form:
<https://ieeeforms.wufoo.com/forms/xl0lxns05xzwir/>

Submission Deadline: *July 1, 2018*

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.

CALL FOR NOMINATIONS—EDS NEWSLETTER REGIONAL EDITOR

The society currently has opportunities for members to join the EDS Newsletter editorial board. This position requires only a few volunteer hours on a quarterly basis, but plays a vital society communication

role. If you have an interest to help promote EDS's social, humanitarian and technical initiatives, please contact Joyce Lombardini in the EDS Executive office at j.lombardini@ieee.org.

2017 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. Mansun Chan was recognized at the IEEE International Electron Devices Meeting in San Francisco, California, December 4th as the 2017 EDS Education Award winner. The award cites Dr. Chan *"For pioneering innovative approaches in electronic engineering education."*

Dr. Mansun Chan received his BS degree in Electrical Engineering and Computer Sciences (highest honors) from the University of California and Ph.D. degree from University of California at Berkeley. He is currently a Professor at the Department of Electronic and Computer Engineering of the Hong Kong University of Science and Technology, an HKIE Fellow, IET Fellow and IEEE Fellow.

Dr. Chan has devoted himself to the education of the next generation engineers. At his home institution, he has been recognized for his effective approaches to convey complex concepts in semiconductor physics to students who have no prior background in quantum mechanics or solid-state physics using modern multimedia tools including computer animations and instant-feedback in-class Q&A systems. His innovative approach in teaching has helped him to win the school's teaching award twice. In addition, he has given many short courses for the semiconductor industry (e.g. Motorola, ON Semiconductor, Solomon Systech and GlobalFoundry) and universities (e.g. UC Berkeley Extension, Tsinghua University, Peking University and Fudan University).



Dr. Mansun Chan (right), receiving the 2017 EDS Education Award from EDS President, Professor Samar Saha at IEDM

Since 2002, he has served as an IEEE EDS Distinguished Lecturer and has given more than 50 lectures to the EDS community. He has also written a very popular textbook, edited two technical books and contributed more than five book chapters.

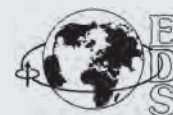
One of Prof. Chan's most notable contributions to educational activities is his effort to motivate, attract, and nurture young future engineers. Since 2008, Prof. Chan has initiated the IEEE Electronic Camp, which has become an annual event that attracts over 100 participants. This has become a signature event of EDS and has been repeatedly reported on in the EDS Newsletter. Recently, Prof. Chan has re-branded the Electronic Camp as an equivalent to IEEE Conference for Student Chapters with a standard and easy-to-follow event template. Since then, the newly branded Electronic Camp has already been launched in Shenzhen, Beijing and San Diego,

benefiting more than 500 students aged from 10 to 18. The events also serve as a means of getting student chapters involved since income from the camps can help to sustain their activities. It has a significant impact on the student activities in EDS. Furthermore, Prof. Chan also started the IEEE Electronic Endeavor Match in April 2017, which has become an annual competition for primary school and secondary school students to compete in breadboard circuit construction. The competition has helped EDS to become more visible among the pre-college students. In the longer term, the objective set for the match is to become an international competition to showcase the achievements of pre-college and college future engineers.

*Meikei leong
2017 EDS Education Award Chair
Hong Kong Applied Science and
Technology Research Institute*



2018 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 2018 award is September 1, 2018.

2017 EDS EARLY CAREER AWARD WINNERS

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 2017 EDS Early Career Award was presented to Dongil Moon of NASA Ames Research Center, California, USA and Shimeng Yu of Arizona State University, Tempe, Arizona, USA at the EDS Awards Dinner held in conjunction with the IEEE International Electron Devices Meeting in San Francisco, California, on December 3, 2017.

Dong-Il Moon is a research scientist at Universities Space Research Association (USRA) and Center for Nanotechnology, NASA Ames Research Center, Moffett Field, California, USA. He was previously a senior engineer of Device & Process Integration Technology Group, SK hynix, Icheon-si, Gyeonggi-do, Korea (2015). He received Ph.D. (2015) and M.S. (2010) from the Department of Electrical Engineering (EE), Korea Advanced



Dong-Il Moon

Institute of Science and Technology (KAIST), and B.S. (2008) from the School of Electrical Engineering and Computer Science, Kyungpook National University, Daegu, Korea.

His honors include the NASA Ames Honor Award as a contractor employee (2017), Distinguished Engineering

Project Achievement Award from The Engineers' Council (2017), the best Ph.D. thesis award in Department of EE at KAIST (2015), grand prize for thesis award from Lam Research Korea (2014), and the best research student award in Department of EE at KAIST twice (2012, 2014).

His research includes fundamental and applied aspects of nanodevices. He has explored the emerging nanoscale devices in layout, mask fabrication, wafer processing, characterization, simulation, and modeling for Logic, DRAM, Flash Memory, and Space Electronics. He has authored or coauthored one book chapter, 77 articles in peer-reviewed scientific journals, and 16 proceeding papers for international conferences. Also, he has 13 issued and pending Korean and US patents. He has published 45 articles in IEEE EDL and T-ED, 10 papers in IEEE IEDM (as a first author and four times as a presenter), and 4 papers in Symposium on VLSI Technology.

Shimeng Yu received the B.S. degree in microelectronics from Peking University, Beijing, China in 2009, and the M.S. degree and Ph.D. degree in electrical engineering from Stanford University, Stanford, California, USA in 2011, and in 2013, respectively. He is currently an assistant professor of electrical engineering and computer engineering at Arizona State University, Tempe, AZ, USA.

His research interests are emerging nano-devices and circuits with a focus on the resistive memories for different applications including machine/deep learning, neuromorphic computing, monolithic 3D integration, hardware security, radiation-hard electronics, etc. He has published >60 journal papers and >100 conference papers with citations >5000 and H-index 32. He is an author or co-author of 20 IEDM papers, 5 Symp.VLSI papers, and 1 ISSCC paper.



Shimeng Yu

Among his honors, he was a recipient of the Stanford Graduate Fellowship from 2009 to 2012, the IEEE Electron Devices Society Masters Student Fellowship in 2010, the IEEE Electron

Devices Society PhD Student Fellowship in 2012, the DOD-DTRA Young Investigator Award in 2015, and the NSF Faculty Early CAREER Award in 2016, and the ASU Fulton Outstanding Assistant Professor in 2017.

He did summer internship in IMEC, Belgium in 2011, and IBM TJ Watson Research Center in 2012. He held a visiting faculty position in Air Force Research Laboratory in 2016. He served the Technical Program Committee for IEEE International Symposium on Circuits and Systems (ISCAS) 2015–2017, ACM/IEEE Design Automation Conference (DAC) 2017–2018, and IEEE International Electron Devices Meeting (IEDM) 2017–2018, etc.

*Fernando Guarin
2017 EDS Early Career Award Chair
GlobalFoundries
Hopewell Junction, NY, USA*

CALL FOR NOMINATIONS 2018 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 International Electron Devices Meeting (IEDM) in December. The recipient will also be recognized at the December EDS BoG Meeting.

Nomination Form: Complete the nomination form by **August 15, 2018**. 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 30 NEWLY ELECTED IEEE ELECTRON DEVICES SOCIETY FELLOWS

EFFECTIVE JANUARY 1, 2018



Paul K.L. Yu
2017 EDS Fellows
Chair

*for contributions to atomistic models
for semiconductor device simulation*

Jeffrey Calame, Annapolis, MD, USA
for contributions to high-power microwave and millimeter-wave amplifiers enabled by composite dielectric materials

Kun-yung Chang, Los Altos Hills, CA, USA
for contributions to transceivers for high-performance networking and high-density memories

Kuan-neng Chen, National Chiao Tung University Hsinchu, Taiwan
for contributions to 3D integrated circuit and packaging technologies

Akira Fujiwara, NTT Basic Research Laboratories Atsugi, Japan

Pamela Ann Abshire, Silver Spring, MD, USA

for contributions to CMOS biosensors

Timothy Boykin, University of Alabama Huntsville, AL, USA

for contributions to silicon single-electron devices

Michel Houssa, University of Leuven Leuven, Belgium
for contributions to materials characterization for advanced MOSFETs

Jaroslav Hynecsek, Allen, TX, USA
for contributions to solid-state image sensors

Thomas Kazior, Raytheon: Radio Frequency Components Andover, MA, USA
for leadership in microwave and millimeter wave compound semiconductor technology and heterogeneous integration with silicon

Michael Krames, Philips Lumileds Lighting Company San Jose, CA, USA
for leadership in GaN-based light-emitting device physics and its commercialization

Isaac Lagnado, San Diego, CA, USA
for leadership in the development of silicon-on-sapphire technology

Xiaobing Luo, Huazhong University of Science & Technology Wuhan, China

for contributions to packaging of optoelectronic devices

Chee Wee Liu, National Taiwan University Taipei, Taiwan
for contributions to high-mobility Ge and SiGe MOSFETs

Ming Liu, Institute of Microelectronics of Chinese Academy of Sciences Beijing, China
for contributions to the development of resistive non-volatile memories

Wei Lu, University of Michigan Ann Arbor, MI, USA
for contributions to development of neuromorphic systems

Zhenqiang Ma, University of Wisconsin-Madison Madison, WI, USA
for contributions to flexible and biodegradable microwave electronics

Saibal Mukhopadhyay, Georgia Institute of Technology Atlanta, GA, USA
for contributions to energy-efficient and robust computing systems design

Hideo Ohno, Tohoku University Sendai, Japan

for contributions to materials and device design for spintronics

Hidetoshi Onodera, Kyoto University
Kyoto, Japan

for contributions to variation-aware design and analysis of integrated circuits

Philippe Paillet, University of Montpellier-CEA Paris, France
for contributions to the understanding of radiation effects in electronics

Joseph Pawlowski, Micron Technology, Inc. Boise, ID, USA
for contributions to memory system interfaces

Seiji Samukawa, Tohoku University
Sendai, Japan
for contributions to damage-free plasma processing for nanodevice manufacturing

Riichiro Shirota, National Chao-Tung University Hsinchu, Taiwan
for contributions to the development of NAND flash memory

Gregory Snider, University of Notre Dame Notre Dame, IN, USA
for contributions to single electron based computing technology

Shuji Tanaka, Tohoku University Sendai, Japan
for contributions to micro-electromechanical systems for acoustic wave devices, physical sensors, and power generation

Victor Veliadis, PowerAmerica Raleigh, NC, USA
for contributions to development of SiC power devices

Robert Weikle, University of Virginia-Charlottesville Charlottesville, VA, USA

for contributions to millimeter-wave and submillimeter-wave electronics and instrumentation for terahertz frequencies

Shien-yang Wu, Taiwan Semiconductor Manufacturing Company, Limited Hsinchu, Taiwan
for leadership in CMOS process integration

Huikai Xie, University of Florida Gainesville, FL, USA
for contributions to micro-electromechanical optical scanning systems

Jianbin Xu, Chinese University of Hong Kong Shatin NT, Hong Kong
for contributions to nanoscale electronic materials and devices

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

Paul Brunemeier
Chuan-Jane Chao
Brian Coppa
Christophe Dolabdjian
Keith Findlater
Uthayakumar G
Elena Gnani
Hidetak Hayashi
Steve Hegedus

Vikram Iyengar
Sneha Kabra
Harish Kittur
Huamin Li
Toshimasa Matsuoka
Viswanathan Nallasamy
Bich-Yen Nguyen
Qiwei Ren

Milton Richardson
Mike Schwarz
Jian-Feng Shi
Aida Todri-Sanial
Yang Xu
Fei You
Yong Zhang
Changjian Zhou



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 can be sent to employers, recognizing this new status. For more in-

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

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

UPDATES FROM THE 2017 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 2017 EDS PhD Student Fellowship recipients were: **Renjie Chen**—University of California, San Diego, USA, **Po-Hsun Chen**—National Sun Yat-sen University, Taiwan, **Hao Yu**—“imec/Katholieke Universiteit, Leuven, Belgium”. The following are brief updates on their progress as provided by the award winners.



Renjie Chen is a PhD candidate at the University of California San Diego, Integrated Electronics and Bio-interfaces Laboratory (IEBL), whose research advisor is Prof. Shadi A. Dayeh. Renjie's research focuses on the fundamental understanding of how the metal and semiconductor form alloyed and compound contacts at atomic-scale, and how their structure is correlated to their electronic behavior. This topic is motivated by solving the stringent requirements

for metal-semiconductor contacts for ultra-scaled electronic devices. Renjie carried out his experiments at the Center for Integrated Nanotechnologies, Sandia National Laboratories, by utilizing the advanced e-beam writer and transmission electron microscope. A video can be found on YouTube (<https://www.youtube.com/watch?v=EUegQrZuKMI&t=>), that describes his work in details.



Po-Hsun Chen is a Ph.D. candidate in the Department of Physics at National Sun Yat-sen University, under the direction of Professor Ting-Chang Chang. His main field of study is in resistive random access memory (RRAM), which is a non-volatile memory for next generation electronic devices. His research focuses on applying transparent conductive oxide (TCO) within the RRAM structure to further enhance device performance and reliability. In addition, he is also working to solve forming voltage issues by introducing a new sidewall spacer in RRAM. Another recent project has him working closely with other researchers to develop vanadium-based selector devices. To date, he has authored 23 peer-reviewed journal papers covering various electron devices.



Hao Yu is currently pursuing a PhD degree at imec/Katholieke Universiteit Leuven under supervision of Prof. Kristin De Meyer and

Dr. Nadine Collaert. He continues his research on the metal-semiconductor contact and expects to defense his PhD thesis close to the summer of 2018. Hao visited Prof. Mark Lundstrom's group at the Purdue University from August 2017 to December 2017 to study the carrier and phonon transport mechanism at the contact interface and in the bulk semiconductor. They have been continuing the collaboration and working on the impact of the stress on the contact resistivity. In addition, Hao has been extending his expertise on the contact resistivity of the group IV semiconductor to that of the group III-V semiconductors. He aims at reducing power consumption of III-V high-speed devices and promoting their applications in the upcoming 5G RF technology.

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

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are interested in storing your datasets long-term or access datasets in IEEE DataPort submitted by other researchers, please login to IEEE DataPort.



2018 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.

Fellowships are expected to be awarded to eligible students in each of the following geographical regions for 2018: 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.

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, 2018**
- Recipients will be notified by July 15
- 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: s.lehotzky@ieee.org

Mail:

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

For more information contact:

Stacy Lehotzky

Email: s.lehotzky@ieee.org

Visit the EDS website:

<http://eds.ieee.org/eds-masters-student-fellowship.html>

**May 15, 2018
Submission Deadline**

UPDATES FROM THE 2017 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 graduate level study and research within the Electron Devices Society's Fields of Interest.

The 2017 EDS Masters Student Fellowship recipients were: **Abhinandan Borah**—from Columbia University, New York, USA, **Jiabin Wang**—From Tsinghua University, Beijing China. The following are brief updates on their progress as provided by the award winners.



bachelor's degree in Electronics and

Abhinandan Borah is currently pursuing doctoral studies in the department of Electrical Engineering at Columbia University. He received his



Jiabin Wang received the B.E degree in electronic science and technology from Tsinghua University, Beijing, China, in 2015, where he is

Communication Engineering from National Institute of Technology, Silchar, in 2013. After graduation, he worked at IBM India as an Associate Systems Engineer for a year. In 2014, he joined Tata Institute of Fundamental Research (TIFR), Mumbai as a Junior Research Fellow in the Nanoelectronics lab, with a fellowship from the Department of Science and Technology, India. At TIFR, his research focus was nanoscale devices with 2D materials. Advancing his interest in unconventional nanoelectronics, his current research at Columbia involves understanding and developing heterostructure devices of 2D semiconductors through both simulations and experiments, in order to contribute towards a post-silicon era in future.

currently pursuing the M.E degree in the Institute of Microelectronics, supervised by Professor Tian-Ling Ren.

His research interests include thin film transistors, synaptic devices, neuromorphic computation systems, low-voltage applications, ferroelectric applications, and critical technology for advanced micro-and nano-electronics. His current research topic is developing novel brain-like electron devices and neuromorphic computation system with higher efficiency, low energy consumption, and novel functionality, to build artificial computation systems in high similarity and comparable efficiency with the human brain. Four of his first-name papers were published in *IEEE Electron Device Letters*.

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

Give Students
The Tools They
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2018 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 2018: 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 2018 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.

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, 2018**
- Recipients will be notified by July 15
- Monetary awards will be given by August 15
- 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>

**May 15, 2018
Submission Deadline**

YOUNG PROFESSIONALS

ARE YOU A YOUNG PROFESSIONAL?

Even if the definition of a young professional at IEEE is that of a person who has graduated from their first technical degree in the last 15 years, **WE ARE MORE THAN THAT!** We make up a quarter of IEEE's population and more than 3000 members in EDS alone. We are **YP**.

Perhaps we are a part of generations X, Y, or Z, or perhaps we belong to another new generation yet to be described. Regardless, we are very active and creative professionals who are interpreting technology in new and different ways. We work in industry, academia, research labs, and governmental agencies, and include entrepreneurs, graduate students, and young faculty, all of whom are fostering technological innovation and excellence for the benefit of humanity. In other words, we enforce the core mission of IEEE on a daily basis.

Some of us were very active as students participating in robotics competitions, attending conferences, revitalizing a chapter at our institution, organizing outreach activities, recruiting members, and enjoying having been a part of an amazing group of people. But now we have advanced in our careers or are caught up in the monotony of our daily routines, and sometimes we forget what inspired us to be part of IEEE. However, we want to stay technically competent and

up-to-date, we would like to be more involved in a global community of like-minded people, we would like a professional network that suits our lifestyle, we want to create new activities and events to network with peers, and we want superior experiences and services that fit our needs. But remember—this is a **VOLUNTEER-LED** organization and nobody is going to do these amazing things for us. We can do it! We need to lead and make them happen. We need to work together to define ourselves, to express our ideas and our needs.

I have personally experienced the vibrant YP network full of enthusiastic people willing to work and enjoy their professions. I also encountered the collaboration, training, support and encouragement from IEEE towards the YP community. Times for change have arrived and a new "business plan" is being implemented (starting last January) to give us more opportunities to interact as a community. Five new projects are under implementation and you will be hearing more from them soon: 1) A new **Volunteering** platform, to allow us to create and find flexible micro-volunteering opportunities, 2) a **loyalty program**, to increase our sense of belonging towards the organization, 3) **IEEE Xplore with YP access**, to lever-



age the existing platform and give YPs more access to technical content, 4) **signature and meet up events**, to promote our presence in high profile areas, and 5) **seed funding**, to support the local events that we organize.

EDS is not falling behind and it is doing its part. We are working to give it a stronger voice using the channels YPs prefer. We are committing to a new **SOCIAL MEDIA STRATEGY** to help us communicate our ideas, create a network, mentor each other, share our activities, and connect using digital channels and social networks. You will hear from our social media platforms this year, but don't just wait—**WE NEED YOU!** We are creating an EDSYP leadership network around the world to strongly connect with local chapters. If you want to share ideas for activities, if something said here resonates with you, or if you want to be a part of the leading team at EDSYP, send us an email at EDSYoungProfessionals@ieee.org and let's work together on creating our own identity! The only question is: Are you a YP, or not?

*Camilo Velez
University of Florida
EDS Young Professionals Committee
Chair (2018–2019)*

NEW WEBINAR AVAILABLE IN THE EDS COLLECTION

ESD PROTECTION DESIGN FOR ICs: PAST, CURRENT AND FUTURE

EDS is many things to its members—scientific publisher, technical conference sponsor, networking resource—but at its core EDS is a community of learning. From undergraduate students and

PhD candidates to tenured professors and world-renowned researchers, EDS provides device engineers from across the spectrum engaging and enriching educational opportunities.

As part of our commitment to enhancing the value of membership in EDS, we are pleased to present the EDS Webinar Archive. The online collection provides our members

with on-demand access to streaming video of past events. The following recently held webinars can be accessed here: <http://eds.ieee.org/webinar-archive.html>.

ESD Protection Design for ICs: Past, Current and Future

Abstract

Electrostatic discharge (ESD) failure is one of the most devastating IC reliability problems. Recent advances in IC technologies and designs, e.g., sub-28 nm CMOS, FinFET, 3D ICs, multi-core SoC, 5G wireless ICs, power electronics and biomedical electronics, makes on-chip ESD protection design extremely challenging. For more than five decades, vast efforts have been devoted to research and development in ESD protection designs. This talk provides a comprehensive and historical review on ESD protection designs for ICs, including the past, the current and the future. The talk will cover the ESD protection basics and fundamentals, existing ESD protection solutions, current ESD protection design and ESD-IC co-design techniques, emerging full-chip ESD protection design verification CAD methods, and future ESD protection concepts.



*Presented by: Prof.
Albert Z.H. Wang*

tively. From 1995 to 1998, he was with National Semiconductor Corporation, USA. From 1998 to 2007, he was an Assistant and Associate Professor in the Department of Electrical and Computer Engineering at the Illinois Institute of Technology, Chicago, USA. Since 2007, He has been a Professor of Electrical and Computer Engineering at the University of California, Riverside, USA, where he is Director for the Laboratory for Integrated Circuits and Systems and Director for the University of California system-wide Center for Ubiquitous Communications by Light. His research covers Analog/Mixed-Signal/RF ICs, Integrated Design-for-Reliability, 3D Heterogeneous Integration, IC CAD and Modelling, Biomedical Electronics, Emerging Nano Devices and Circuits, and LED-based Visible Light Communications. Wang received the CAREER Award from the National Science Foundation, USA. He published one book and more than 250 papers, and holds 13 US

Albert Wang received the BSEE degree from Tsinghua University, China, and the PhD EE degree from State University of New York at Buffalo, USA, in 1985 and 1996, respec-

patents. Wang was editor and guest editor for IEEE Electron Device Letters, IEEE Transactions on Circuits and Systems I, IEEE Transactions on Circuits and Systems II, IEEE Journal of Solid-State Circuits and IEEE Transactions on Electron Devices. He has been an IEEE Distinguished Lecturer for IEEE Electron Devices Society, IEEE Solid-State Circuits Society and IEEE Circuits and Systems Society. He is Sr. Past President (2018–2019), and was Jr. Past President (2016–2017) and President (2014–2015) of IEEE Electron Devices Society. He was Chair of the IEEE CAS Analog Signal Processing Technical Committee (ASPTC) and committee member for the SIA International Technology Roadmap for Semiconductor (ITRS). He is IEEE 5G Initiative member. He is a member of IEEE Fellow Committee. He was General Chair (2016) and TPC Chair (2015) for IEEE RFIC Symposium. He served as committee member for many IEEE conferences, including IEDM, EDTM, BCTM, ASICON, IEDST, ICSICT, CICC, RFIC, APC-CAS, ASP-DAC, ISCAS, IPFA, ICEMAC, NewCAS, ISTC, IRPS, AP-RASC, MAPE, EDSSC, MIEL, etc. Wang is an IEEE Fellow and AAAS Fellow.

*Tian-Ling Ren
Tsinghua University
EDS Education Chair*

THE IEEE ED/SSC HK JOINT CHAPTER AND HKUST CO-ORGANIZED THE ELECTRONIC EXPLORATION CAMP TO EXPOSE 81 SCHOOLCHILDREN TO FASCINATING ELECTRONIC TECHNOLOGIES

By SANG LAM AND MANSUN CHAN

As a continuation of a series of successful STEM (science, technology, engineering and mathematics) educational activities to inspire children to study and work in electronic engineering or related areas, IEEE Electron Device and Solid-State Circuit (ED/SSC) Hong Kong Joint Chapter and the De-

partment of Electronic and Computer Engineering (ECE) of the Hong Kong University of Science and Technology (HKUST) co-organized a 3-day Electronic Exploration Camp on December 27–29, 2017 at the scenic campus of HKUST with state-of-the-art multimedia teaching facilities.

The series was initiated by Prof. Mansun Chan in 2012 and this is the 6th occurrence of such an event with several dozens of schoolchildren coming to HKUST to explore the fascinating electronic technologies through electronic circuit construction sessions and lab tours. Through learning



Eighty-one schoolchildren gathered with student helpers and staff ready for the exciting three days of learning and fun at the scenic campus



Undergraduate student leaders giving instructional guidance to kids in constructing electronic circuits on a breadboard

and trying to build a few interesting electronic circuits, in particular a running light indicator, an electronic piano and an infrared detector, participating children have been introduced to major areas of electrical and computer engineering (ECE), namely digital integrated circuits, photonics, signal and multimedia processing. They also learned some key electronic engineering concepts such as voltage and current, signals, electrical measurements, clock generation and the use of mathematics in engineering that are taught in ECE programs at the university level. While touring around research and teaching laboratories, they were also exposed to other technology pillars of ECE such as nanosystem fab-

rication, control and robotic systems, applied electromagnetics and wireless communications. The students were captivated by various experimental demonstrations in the research labs, especially if they were allowed to try the demonstrations by themselves.

With successes of previous years, Prof. Chan was joined with Dr. Sang Lam this year to supervise 14 student helpers in giving instructional guidance to 81 schoolchildren in electronic circuit construction and other educational activities over the three days in December. The 14 student helpers, who are all science and engineering undergraduates at HKUST, also benefitted from the event. From the preparation stage, they learned from Prof.

Chan and Dr. Lam the event organization, task management and problem solving. They also developed their abilities in communicating technical ideas in a concise manner throughout the process of guiding the children to construct electronic circuits. While serving as student helpers in leading groups of children, they realized the importance of leadership qualities and active thinking that are much needed in their future careers, especially in meeting demands of customers or clients.

This year, a fee-waiving scholarship arrangement was introduced and seven schoolchildren from underprivileged families were awarded scholarship to join the IEEE Electronic Exploration Camp. The scholarship was arranged with the administration help from the Academy for Bright Future Young Engineers (ABFYE). With such a scholarship arrangement, schoolchildren with keen interest and strong potential will not be deprived of the educational opportunities because of their family's disadvantaged economic status. With their excitement and skill in electronic circuit construction developed in the three-day event, both the scholarship recipients and the other schoolchildren have been encouraged to participate the forthcoming IEEE Electronic Endeavor Match to be held on April 7, 2018 at Hong Kong Science Park. It is a competition for the participants to test their abilities to understand the conceptual circuit diagrams and then build the functional electronic circuits on a breadboard in the shortest time.

CHAPTER NEWS

MQ, DL AND CONFERENCE REPORTS

ED GERMAN CHAPTER & IHTN TU DARMSTADT ORGANIZE SYMPOSIUM ON SCHOTTKY BARRIER MOS DEVICES—"DEVIL OR SAVIOR"

It is the 40th anniversary of Institut für Halbleitertechnik und Nanoelektronik (IHTN) of the TU Darmstadt, Germany. In addition to many activities in September, a small symposium on Schottky Barrier MOS (SB-MOS) devices is planned for August 7, 2018 in Darmstadt. This is the second meeting of an enthusiastic group of Schottky barrier researchers and this year it is sponsored by the ED German Chapter and hosted by the IHTN of TU Darmstadt.

Before announcing more details, a brief history. The first meeting of this group was held in the summer of 2016. It was a spontaneous workshop organized by Dr. Mike Schwarz (Robert Bosch GmbH, Germany), who met Dr. Tillmann Krauss (TU Darmstadt, Germany) and Dr. John P. Snyder (JCap, LLC) via the researchgate.net website. John was planning to visit Europe that summer and asked if there was a possibility to meet to align future projects. Till and Mike agreed and the meeting was held on August, 5th

in Ueberherrn, Germany. They discussed the challenges, benefits and possible future projects of these devices. Shortly after the meeting Dr. Laurie E. Calvet (Université Paris-Sud, France), Prof. Udo E. Schwalke (TU Darmstadt, Germany) and Prof. Alexander Kloes (THM, Germany) joined the project and some great contributions were the result e.g. "On the Physical Behavior of Cryogenic IV and III-V Schottky Barrier MOSFET Devices M. Schwarz", L.E. Calvet, J.P. Snyder, T. Krauss, U. Schwalke, A. Kloes, IEEE Transactions on Electron Devices 64 (9), 3808–3815. More contributions are in progress and will hopefully find their way into the EDS community.

This year the symposium is organized by Dr. Tillmann Krauss, Dr. Udo E. Schwalke, Dr. Mike Schwarz and the staff of the TU Darmstadt. The symposium starts at 11:00 am in the lecture hall at the IHTN TU Darmstadt. The following agenda is planned:

Dr. Laurie E. Calvet from Université Paris-Sud, France will give a talk en-

titled "*Modeling of neuromorphic devices*", Dr. John P. Snyder from JCap, LLC will present a presentation on "*Benefits of Schottky Barrier vs. Conventional Doped Source/Drain MOS devices*", Dr. Mike Schwarz from Robert Bosch GmbH, Germany plans to present "*Wrap-Up of Schottky Barrier Simulation Methodologies*", Prof. Udo Schwalke from TU Darmstadt will give a talk entitled "*Nanoelectronics: From Silicon to Carbon*", Dennis Noll, a PhD student from TU Darmstadt will present "*Transfer-free fabrication of nanocrystalline graphene field-effect sensors*", Prof. Alexander Kloes from Technische Hochschule Mittelhessen plans to present "*DC/AC compact modeling of Tunnel-FETs*" and Dr. Walter Weber from TU Dresden will give a talk about "*Nanowire Schottky devices*."

Attendees are welcome to attend the symposium. Further information are present at http://www.ihtn-tu-darmstadt.de/ihtn_institute/

~ Mike Schwarz, Editor

ED GERMANY CHAPTER ORGANIZES MINI-COLLOQUIUM "MARVELS OF MICROELECTRONIC ENGINEERING" IN STUTTGART, GERMANY

Engineering and microelectronics engineering in particular most often uses top-down approaches defined and scheduled on the ITRS roadmap. But there are also numerous cases in which we engineers had discovered

very elegant ways of using materials, of developing fabrication processes, of building device structures, of modeling and measuring devices, and of defining integration technologies. Those bottom-up techniques often meant

a major leap in microelectronics miniaturization and advanced state-of-the-art unexpectedly. They were sometimes discovered coincidentally (such as AlCu interconnects) or resulted from a technological artifact (such



Joachim Burghartz

as the spacer sidewall), they came with new technological capabilities (such as fully depleted SOI and FinFET), or they simply originated from an engineer's ingenuity (such as the DRAM circuit). We all know about them, but we take them for granted in our daily work. The motivation of the MQ was therefore to bring together distinguished lecturers and other experts from different areas, shedding light on those technological milestones in order to stimulate the discovery of similar technological advancements in the future.

The Mini-Colloquium "Marvels of Microelectronic Engineering" was conveniently scheduled on September 15,

2017, right after ESSDERC 2017 in Leuven, Belgium. We had four talks by experts from different areas of electron devices, in which they selected favorite "Marvels" to present and discuss with the participating EDS members and guests. Prof. Manfred Berroth from the University of Stuttgart talked about Gallium-Nitride as "a defect tolerant semiconductor" which enabled several breakthroughs, with the blue LED as the major invention. He also highlighted silicon photonics and metamaterials. Prof. Joachim Burghartz from IMS CHIPS in Stuttgart had process technological features and materials as his selected favorite, and discussed the sidewall spacer, Silicon-Germanium, and the Polysilicon Emitter. Dr. Simon Deleonibus, formerly with CEA-LETI and previous

EDS Secretary, brought LOCOS and Shallow-Trench isolation techniques, non-volatile memories and AlCu and Cu multilevel interconnects into the discussion. Finally, Dr. Franz Laermer from Robert Bosch GmbH and recipient of the IEEE Jun-ichi Nishizawa Medal for his work on the deep-RIE "Bosch Process" discussed dry-etching and MEMS as his marvels.

As an outcome of this MQ, Joachim Burghartz and Simon Deleonibus will organize a series of articles on "Marvels of Microelectronic Engineering" in 5 editions of the EDS Newsletter, which already was agreed on by Newsletter Editor-in-Chief Carmen Lilley. The first and introductory article is planned for July 2018.

~ Mike Schwarz, Editor

MINI-COLLOQUIUM ON NANO-ELECTRONICS ED UTTAR PRADESH SECTION—KANPUR CHAPTER

By YOGESH CHAUHAN

The ED Uttar Pradesh (UP) Chapter organized a Mini-Colloquium (MQ) on Nanoelectronics, on Aug 26th, 2017 and a Distinguished Lecture series on "Interface Physics and Analysis Challenges in Si Nanodevices" on Sep 18, 2017.

The MQ was inaugurated by Prof. S. Ganesh, Dean R&D IIT Kanpur and Prof. J. Ramkumar, Chair, IEEE ED UP Section. The technical session started with the lecture delivered by Dr. Navkanta Bhat, Professor IISc. Bangalore, on "Nanotransistors with 2D material: Opportunities and Challenges." Then, Prof. V. Ramgopal Rao, Director of IIT Delhi, spoke on "Bottom-up meets top down: An integral Approach for High Performance CMOS & Sensor Technologies." Dr. Brajesh Kumar Kaushik, Associate Professor of IIT Roorkee, gave a talk on "Spintronics—Perspective



Participants of the EDS MQ at IIT Kanpur

and Challenges." Dr. Chandan Kumar Sarkar, Professor, Jadavpur University, presented his research on "Advanced Heterostructure based Nanoscale MOSFETs." Dr. Anisul Haque, Professor, East West University Bangladesh, delivered a lecture on "Revisiting gate C-V characterization for high mobility semiconductor MOS devices." The colloquium concluded

with the talk given by Dr. Yogesh Singh Chauhan, on "ASM-HEMT: First Industry Standard Compact Model for GaN HEMTs." The event was attended and well received by over 120 attendees with 50 IEEE members and included students and faculty members from various universities.

~ Manoj Saxena, Editor

MINI-COLLOQUIA ON "INSIGHTS OF EMERGING NANOSCALE RESEARCH DEVICES" ED DELHI CHAPTER

By R. S. GUPTA AND SNEHA KABRA

A Mini-Colloquia (MQ) was jointly organized by IEEE ED Delhi Chapter and the Department of Electronics and Communication Engineering, Maharaja Agrasen Institute of Technology (IP University, New Delhi), Rohini, New Delhi, India on "Insights of Emerging Nanoscale Research Devices" on December 11, 2017 at IP University, New Delhi and which was supported by the IEEE Electron Devices Society.

Prof. R. P. Jindal, Fellow, IEEE, Vanderziel Institute of Science and Technology, LLC, Princeton, NJ, USA discussed refinements in a device structure that have led to improvement in noise performance by suppressing the effects of extrinsic noise mechanisms in MOS devices. Prof. Bin Yu, IEEE Fellow & IEEE EDS Distinguished Lecturer, State University of New York discussed graphene (two-dimensional carbon sheet) and its derivative mate-

rial systems that have received significant amount of research interests from both academia and industry. Prof. Vijay Arora from Wilkes University, USA, discussed the paradigm shift from Ohm's Law. The experimental nonlinear I-V characteristics, when voltage across the length of a resistor is higher than its critical value, defy ohmic and ballistic transmission through a nanoresistor.

~ Manoj Saxena, Editor



Group Photograph of Delegates who attended the MQ

EDS DISTINGUISHED LECTURE AT ED HAWAII

The IEEE ED Hawaii Chapter hosted on November 29, 2017 a Distinguished Lecture by Dr. Simon Deleonibus on "On the Way to the Energy and Variability Efficient (E.V.E.) Era" at the University of Hawaii Manoa campus. Simon's lecture was attended by 21 professionals and students from the IEEE Hawaii Section. The photo shows Simon receiving a certificate of appreciation for his seminar talk from the Hawaii section chair, John Borland.

~ Kyle Montgomery, Editor



IEEE INTERNATIONAL MICROWAVE, ELECTRON DEVICES, SOLID-STATE CIRCUITS SYMPOSIUM (IMESS) 2017 “IoT AND INDUSTRIAL 4.0—THE PATHWAY TO SMART CITIES AND MANUFACTURING”, OCTOBER 4-5, 2017, PENANG, MALAYSIA

BY DR. LEE CHOO YONG

The success of the inaugural International Microwave, Electron Devices, Solid-State Circuits Symposium (IMESS) in 2016 motivated the IEEE ED/MTT/SSC Penang Joint Chapter (IEEE Penang) and Penang Skills Development Center (PSDC) to co-organize the second IMESS in 2017, with strong support from industry sponsors. The admission was free to IMESS 2017 and the theme was “IoT and Industrial 4.0—The Pathway to Smart Cities and Manufacturing.” The symposium was successfully held on October 4–5, 2017 in PSDC, Penang, Malaysia with 200 attendees, mostly engineers and scientists from northern region of Peninsular Malaysia. The objectives of IMESS are

- To promote IEEE activities among the engineering community in Penang.
- To create a platform that engineers could share their technical knowledge especially among the different IEEE society for example Electron Devices Society, Microwave and Techniques Society and Solid-State Circuit Society.

- To share and strengthen local science and engineering advancements to the engineering community
- To provide networking opportunities and connect technical communities
- To address the issue of polarization in both industry and academia
- To bridge the gap and synchronize industry advancement and academia research

The IMESS2017 Chair was Mr. Bernard Lim Kee Weng, who is also treasurer of IEEE Penang. A total of 4 keynote speakers and 23 invited speakers from Malaysia, Japan, United States, Singapore and Hong Kong delivered technical talks under ED, MTT and SSC tracks. Three of the speakers, namely Dr. Chuah Hean Teik, Dr. Vivek De and Professor Mansun Chan, were IEEE fellows. The industry sponsors of IMESS 2017 are Silterra and Tektronix (Diamond), Genetron, Infineon Technologies, Keysight Technologies, Rohde & Schwarz and Tekmark (Platinum) and Iridium (Gold). IMESS 2017 is also supported by IEEE Region 10,

Electron Devices Society (EDS), Microwave Theory and Techniques Society (MTT-S), Solid-State Circuit Society (SSCS), The Institution of Engineers Malaysia (IEM), investPenang and student volunteers from Universiti Teknologi Petronas, Universiti Sains Malaysia and KDU Penang University College. A student technical visit, by 20 students, to the Intel Penang factory was also organized for the afternoon of October 5, 2017 and was an important occasion for students to explore an electronics manufacturing environment.

IMESS2017 commenced with keynote address by Professor Chuah Hean Teik followed by Dr. Khoh Soo Beng at PSDC auditorium chaired by Dr. Wong Peng Wen. Professor Chuah discussed the influence of industrial evolutions and technology on history of mankind, challenges ahead and necessary skills for future engineers. Professor Chuah also highlighted issue of low science student population at secondary school and called upon fellow engineers to encourage more students to pursue science, technology,



Group Photo at the closing session of IMESS 2017

engineering and mathematics (STEM) courses. Professor Chuah concluded the talk by sharing story of Lion and Gazelle from "The World is Flat" by Thomas L. Friedman. Subsequently, Dr. Khoh Soo Beng also delivered a keynote address on IoT innovation to improve healthcare monitoring system. A speaker appreciation dinner was held at the OliverTree Hotel. It was a good celebration, where speakers and IEEE Penang committee members had the opportunity to get well acquainted, share ideas and thoughts, while enjoying delicious Malaysian cuisines for which Penang is famous.

The opening ceremony was held on the second day, IMESS2017 Chair Mr. Lim delivered a welcoming speech, followed by PSDC Mr. Mohammed Mydin and Penang Chief Minister The Right Honourable Tuan Lim Guan Eng. This was followed by a press conference, exhibition booth tour and keynote speeches by Dato' Lai Yit Loong of Silterra and Naresh Kumar of Tektronix. During the open-

ing speech and press conference, the Chief Minister mentioned that Penang is on the right track in embracing Industry 4.0, he also urged industry players to introduce and implement Industry 4.0 elements such as artificial intelligence, robotics, cloud computing, big data analytics, cyber security, Internet of Things, and others in their factories and businesses in order to continue succeeding. It was also highlighted that the state has invested RM68 million in scientific initiatives and Penang has focused on education of Science, Technology, Engineering and Mathematics (STEM) in order to succeed in Industry 4.0. During press conference, the Chief Minister also expressed interest on wafer technology and requested Dato' Lai to explain wafer applications and potential in IoT markets to the media. The video of Penang Chief Minister opening speech and press conference are available on <https://youtu.be/SSvPkoHjVf0> and <https://youtu.be/30pmyyN6zv4> respectively. In addition to technical ses-

sions, delegates also visited exhibition booths hosted by Silterra, Tektronix, Genetron, Rohde & Schwarz, Keysight/Tekmark and Synvue to see their products and solutions in IoT applications. IEEE Penang also set up the booth for a membership drive and received overwhelming enquiries about IEEE membership. The IMESS committee received positive responses from IMESS 2017 delegates and they look forward to attend IMESS 2018. The symposium was adjourned with closing speech by Mr. Bernard Lim and a group photo. In summary, IMESS2017 is a successful symposium with utmost support from all stakeholders. This has made IEEE visible and relevant to E&E industry in Malaysia particularly in northern region. IEEE Penang appreciates feedback from delegates, the hard work doesn't stop at IMESS2017, IEEE Penang will set up organizing committee for IMESS2018 soon!

~P Susthitha Menon, Editor

REPORT OF THE 2017 IEEE S3S CONFERENCE

The 2017 IEEE S3S Conference was held October 16–19 at the Hyatt Regency San Francisco Airport and was attended by more than 170 researchers from across the globe, a significant growth compared to recent years. This year marked the 43rd anniversary of the conference, which has been the premier IEEE event to cover advances in the SOI technology. Since 2013, we have expanded the focus of the conference to include 3D technologies and low power devices and circuits, building on the synergy between the 3D wafer processing and SOI technology, with the goal to posit these technologies as the platform to realize future low power systems.

The conference started with three plenary talks, covering its main pillars, namely 3D integration, SOI technology and new devices, and technologies

and circuits for low power systems. Al Fazio, Intel Senior Fellow and Director of Memory Technology Development discussed the advances made in 3D memories, covering both 3D NAND and 3D XPoint technologies. He argued that they can revolutionize information processing in the same fashion that skyscrapers revolutionized society more than a century ago by bringing significantly higher data density close to the processing units. The next plenary talk was prepared by Ted Letavic, GlobalFoundries's Senior Fellow and was delivered by Tim Dry, covering the company's advancement in FDSOI, RFSOI and photonics technologies. The third plenary talk was given by Professor Suman Datta, Chang Family Chair Professor of Engineering Innovation at the University of Notre Dame, who shared his

thoughts on novel devices, technologies and circuit concepts that enable the next generation of information processing. This was followed by 112 technical presentations through 2 parallel tracks and a poster session.

We also continued our tradition of offering educational opportunities at the conference. This year, we held our 23rd short course on Thursday which was dedicated to FDSOI circuit design. Experts from academia and industry taught about different aspects of circuit design in FDSOI by covering fundamentals of the technology, body biasing and body bias generation, low power circuit design in FDSOI, as well as analog and RF circuits. Given the FDSOI technology offering at multiple foundries and multiple nodes, including 65 nm, 28 nm and 22 nm, this was a unique and timely



Dr. Ali Keshavarzi introducing the panelists at the 2017 IEEE S3S Conference rump session

opportunity for circuit designers to learn first-hand from distinguished experts and bring in their technical questions and concerns. More than 50 attended this full day short course. In addition, we also offered a half-day tutorial on 3D technologies, covering both traditional 3D technologies and monolithic 3D integration to all conference attendees.

On Monday evening, after the conference poster session and reception, we hosted a very exciting rump session on Semiconductor Technologies Driving Architectures for Brain-Like Efficient AI. The rump session was organized and moderated by Dr. Ali Keshavarzi of Leading Edge Research. A renowned panel including Dr. William Chappell, Director of DARPA MTO, Professor Suman Datta, Dr. Norm

Jouppi, Distinguished Engineer at Google, Dr. Amir Khosrowshahi, CTO of Intel's AI Product Group, Dr. Dinesh Maheshwari, Partner at Silicon Catalyst and Professor Kaushik Roy of Purdue University shared their viewpoints. For the first time we opened the rump session to all IEEE members as a benefit to the local IEEE community. In addition, we held two special sessions on neuromorphic computing on Wednesday morning, organized by Dr. Nuo Xu that complemented the panel discussion.

This year we also made arrangement so that the attendees can take advantage of two satellite events. The 5th Berkeley Symposium on Energy Efficient Electronic Systems and the Steep Transistor Workshop was held on Thursday and Friday of the same

week at the campus of the UC Berkeley. The E3S Symposium is supported by IEEE EDS and given the synergy of its topics and the low power content of the IEEE S3S Conference. We look forward to continued collaboration in the future. This year, we held a special poster session in which students and researchers participating in the E3S center presented their work to S3S attendees. The second event was the CoolCube™/3D VLSI Open Workshop organized by Leti and Qualcomm on Tuesday morning at the conference venue. Even though this was an independent event, our goal was to use any opportunity to deliver more technical content to our membership and we will continue to do so in the future. Finally, we are planning a special issue of the IEEE Journal of Electron Devices Society that will cover extended versions of a selected group of the papers presented at the conference. Dr. Nobuyuki Sugii of Hitachi and myself are serving as the Guest Editors of the journal and are on track to publish the special issue in early 2018.

The 2018 edition of the conference will be held October 15–18 at the Hyatt Regency San Francisco Airport. As the General Chair of the conference in 2018, I invite you to submit your contributed papers by May 25 and look forward to your strong participation.

*Ali Khakifirooz
Technical Program Chair
2017 IEEE S3S Conference*



Dear EDS Member:

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 too must our awards. If you would like to suggest new awards, we would welcome your comments and suggestions.

Sincerely,
Samar Saha
EDS Awards Committee Chair

[Visit the EDS Website](#)



Pasqualina M. Sarro
2018 Robert Bosch Micro and
Nano Electro Mechanical
Systems Award Winner

[Robert Bosch Award](#)

[J.J. Ebers Award](#)

[Distinguished Service Award](#)

[Education Award](#)

[Early Career Award](#)

[William R. Cherry Award](#)

[PhD Student Fellowship](#)

[Masters Student Fellowship](#)

[Region 9 Outstanding Student
Paper Award](#)

[Chapter of the Year Award](#)



*Although the IEEE Electron Devices Society (EDS) is pleased to invite all individuals and groups in the OFAC embargoed countries to submit nominations for IEEE EDS Awards, the IEEE EDS cannot provide any award monies to members from such countries at this time.

REGIONAL NEWS

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

ED South Brazil Chapter University of Sao Paulo, Brazil —by Paula Agopian

The IEEE ED South Brazil Chapter won the 2017 Region 9 Chapter of the Year Award. The award was received by the chapter chair Joao Martino on December 3, 2017 in San Francisco, USA. Prof. Joao Martino also received two certificates in recognition and appreciation of values services and contributions as EDS Distinguished Lecturer since 2007 (10 years) and EDS Region 9 Latin America Newsletter Editor (2015–2017).



Joao Martino (right) receiving the 2017 IEEE EDS awards in San Francisco, USA, from Samar Saha (left), EDS President

EDS SRC Report —by Jacobus Swart

The EDS Session and Region Chapter Chair (SRC) team for Region 9 is composed of four chair and vice-chairs. During last BoG Meeting they were awarded for their voluntary service and contributions during the last 6 years. The year 2017 was especially successful for the region, with an in-



Award received by the team members present at the BoG ceremony (left to right) Jacobus Swart, Joao Martino and Arturo Escobosa

crease of about 70% in memberships. The number of members increased by 222 individuals to 526 members total. This extraordinary growth can be attributed as a result of the organization of many activities. Some highlights of these activities were the mini-colloquia, seminars, conferences, a best student paper award, a “hackathon” and many Snap Circuits kits used to teach young children (<http://eds.ieee.org/the-eds-etc-program.html>). The SRC team for Region 9 also had several virtual meetings to promote and discuss activities. Sub-region chapter meetings were also held, one in Brazil,

one in Colombia and one in Mexico. One of the vice-chairs was appointed to focus on each of these three sub-regions (including neighboring countries), making a direct contact with the corresponding chapter chairs in that sub-region. Finally, the inspiration and support of M. K. Radhakrishnan, VP of Regions and Chapters for EDS, and Fernando Guarin, President of EDS, among others, were of paramount importance for the results. We also see still great opportunity for growth in the region, due to education and economic growth trends, but above all due to the vibrant atmosphere and enthusiasm of the students and professionals.

Mexican Chapters Meeting —by Arturo Escobosa

The third EDS Mexican Chapters Meeting took place in Mexico City on November 24, 2017, following the events in Cholula, Puebla in 2015, and Boca del Río, Veracruz, in 2016. These meetings have proved to be a useful activity in order to exchange



Participants of the EDS Mexican Chapters meeting in 2017



Members of the IEEE EDS Cinvestav-IPN Student Branch Chapter and IEEE Mexico Chapter with the Distinguished and Invited Lecturers

opinions, increase interaction and discuss the different problem faced by each chapter. There were 20 participants representing six Mexican and two recently created Nicaragua ED chapters. After a brief introduction of an overview of IEEE guidelines, every chapter gave a brief presentation of the main activities made during last year. We finished by discussing challenges faced by the different chapters, including strategies to attract more people to join EDS. It is noteworthy to also mention the activities of the EDS-ETC program, in particular those performed by the chapters in Puebla and Morelia.

ED Avanzados Cinvestav-IPN Student Branch Chapter and ED Mexico Chapter Mini-Colloquium —by César Pons

The ED Avanzados Cinvestav-IPN Student Branch Chapter and ED Mexico Chapter jointly organized the ED Avanzados Cinvestav-IPN Student Branch Chapter and ED Mexico Chapter Mini-Colloquium on October 5, 2017 at Cinvestav-IPN and on October 6, 2017 at Benemérita Universidad Autónoma de Puebla (BUAP) and Universidad de Ciencias y Artes de Chiapas (UNICACH). The two days program featured three IEEE EDS Distinguished Lecturers: Professor of Centro Universitário da FEI Dr. Marcelo Pavanello and Professors of Universitat Rovira i Virgili Dr. Lluís Marsal and Dr. Benjamín Iñiguez; and four invited Lecturers: Research Scientist of The University of Texas at Dallas and IEEE Senior Member Dr. Israel Mejía, CONACYT Professor of Cen-

tro de Ingeniería y Desarrollo Industrial (CIDESI) Dr. Víctor Balderrama and Professors of the Consiglio Nazionale delle Ricerche (CNR) Dr. Luigi Mariucci and Dr. Antonio Valletta. The first half of the program consisted of two DL talks titled “Unified Modeling and Parameter extraction of Thin Film Transistors” and “Junctionless Nanowire Transistors Performance Static and Dynamic Modeling” by Profs. B. Iñiguez and M. Pavanello, respectively and an invited lecturer (IL) on “High Performance in Organic Solar Cells” by Prof. V. Balderrama. The second session consisted of a DL titled “Architecture, mechanisms and materials for polymer solar cells” by Prof. L. Marsal and two IL talks titled “Implementation of a Polysilicon Thin Film Transistor Node for Integrated Cir-

cuits” and “Fully Printed OTFTs: Fabrication, Characterization and Modeling” by Dr. I. Mejía and Profs. L. Mariucci and A. Valletta, respectively. The program was attended by 50 participants, and consisted of postgraduate students and professors from Cinvestav and engineering colleges and universities of the region.

EDS-ETC in Campus Party Bahia ED Federal University of Bahia, Brazil, Student Chapter —by Andre Bahiense

It is a fact that the development of technology has reached different spaces and different social sectors. As the need for learning, exchange of experiences and networking has grown significantly, one of the biggest technology events in the world, the Campus Party, has been created. The Campus Party is present in twelve countries and Salvador, the capital of Bahia in Brazil, had the privilege of hosting one of the events in early August of that year. The ED Student Chapter, together with the PES Chapter also from the Bahia Section, were present at the event with more than ten student volunteers and promoted



The EDS-ETC display table

two ETC workshops, as well as having a table display during the four days of the event. Being an open event to the public, the Campus Party had an average attendance of 20 thousand people daily and it was estimated that more than 700 people went through the EDS-ETC workshop and table display. Participants were able to interact with all of the Snap Circuit Kits projects, in addition to being able to talk and have the support of ED volunteers and other IEEE members. This is the first event of its kind in the region, so a great number of different people have come to exchange experiences, from children to adults and especially young people from underserved communities. The activities were a success and good feedback was received from both the participants and the organizers of the event.

At ED Federal University of Bahia Student Chapter, we seek this kind of contact to instigate people in technology, showing new opportunities and bringing the community closer to the different subjects developed by the volunteers.

~ Joao Antonio Martino, Editor

EUROPE, MIDDLE EAST & AFRICA (REGION 8)

ED Spain Chapter

The ED Spain Chapter organized an EDS Distinguished Lecture (DL) by Dr.



Dr. Muhammad Mustafa Hussain during his distinguished lecture



Dr. Muhammad Mustafa Hussain (middle) with Prof. Lluís F. Marsal and Prof. Benjamin Iñiguez and participants

Muhammad Mustafa Hussain, January 31, 2018. The event was held at the Department of Electronic Engineering of the University Rovira i Virgili, Tarragona. Dr. Muhammad Mustafa Hussain from King Abdullah University of Science and Technology (KAUST) of Saudi Arabia, presented his research work entitled: **Electronics for All**. He presented insightful ideas for the challenges of the future electronic systems based on the rational design of new materials, processes and devices. There was good technical interaction between the invited speaker and participants. The talk was attended by about 25 participants, including faculty and students both IEEE EDS members and non-members.

~ Mike Schwarz, Editor

IEEEESTEC 2017 International Student's Projects Conference

—Danijel Danković

The IEEEESTEC—10th International Student's Projects Conference was held on November 23, 2017, at the Faculty of Electronic Engineering, University of Niš, Serbia. The conference was organized with support of EESTEC LC Niš,

IEEE Student Branch Niš and Faculty of Electronic Engineering Niš. The event was supported by the IEEE Electron Devices/Solid-State Circuits Chapter, the IEEE Microwave Theory and Techniques Chapter and the IEEE Serbia and Montenegro Section. The welcome and opening speech was delivered by Danijel Danković, chairman of the conference. The opening address was followed by provost Vesna Lopičić, Nebojša Dončov, the vice dean of Faculty of Electronic Engineering Niš, and Vera Marković, the vice president of IEEE Serbia and Montenegro Section.

The conference proceedings contained a total of 75 papers which covered a wide range of topics. Based on evaluation of the quality of the papers, Best Paper Awards were presented. These awards were assigned for the papers with the best practice implementation, IEEE Women in Engineering award, IEEE MTT special award and IEEE Region 8 Student Paper Contest award. All participants had the opportunity to show posters and demonstrations of their projects. The full-day event ended with the handing of the special awards for best project according to the choice of the authors of papers. The conference



IEEEESTEC Conference opening

was very well received by the attendees of about 350 high school and academic students, in terms of organization and opportunities for discussion. The conference was helped by many sponsors. More information about IEEEESTEC Conference can be found at <http://ieee.elfak.ni.ac.rs>.

~ Marcin Janicki, Editor

ASIA & PACIFIC (REGION 10)

ED/CPMT/R Singapore Joint Chapter & Singapore University of Technology & Design, Student Branch Chapter

—by Tak Kok Tong

Membership Drive Program

The Chapter together with the team of SUTD Student Committee organized a membership drive in May/June 2017 and recruited over 100 student members. The new student members embraced our activities with gusto and made the activities such as the SUTD Open House, Singapore MakerFaire, Outreach Workshops and a Home Automation Projects Term a great success! Furthermore, they helped the Chapter to host visitors from IEEE EDS Malaysia, and also lent a hand in two nationwide hackathons. The Student Committee will continue to work with our Chapter to run our year-end Social Initiative (The Learning Journey), and also support our upcoming flagship conferences the Electronics Packaging Technology Conference (EPTC 2017) and the International Symposium on the Physical and Failure Analysis of Integrated Circuits (IPFA) 2018. My special thanks to Professor Pey Kin Leong for his role in making this recruitment drive a tremendous success, and as the advisor to the Student Committee.

EPTC 2017

This event was held from 6 to 9 December 2017 and chaired by Dr

Xueren Zhang. It was inaugurated in 1997 and this year is the 19th EPTC which was held at the Grand Copthorne Waterfront Hotel, Singapore. The vision of the event is to be a premier electronics packaging conference in Asia Pacific region through high quality publications, presentations and world class professional developmental activities. The organizing committee was comprised of 14 members from different companies and organizations. There were 10 technical topics including Advanced Packaging, TSV/Wafer Level Packaging, Interconnection Technologies Emerging Technologies, Materials and Processing, Equipment and Process Automation, Electrical Modeling & Characterization, Mechanical Modeling & Simulations, Thermal Characterization and Cooling Solutions, as well as Quality, Reliability and Failure Analysis. Fourteen invited speakers were present at the event. More information can be obtained from this website: <https://eptc-ieee.ne>

IPFA 2017

This event was held from July 4-7, 2017 and the co-chair is Dr Szu Huat Goh. The IPFA 2017 was held in Chengdu, China and drew close to 300 attendees. The IPFA 2017 technical program kicked off with a day of tutorials followed by 3 days of symposiums. As with each IPFA, there was an exhibition, and this year the exhibition drew 38 leading suppliers exhibiting their products/services and solutions.

Technical Program

The Chapter co-organized one workshop with the Temasek Laboratories@NTU on May 24, 2017 at NTU. The workshop, titled "SiP, Packaged Stacked Devices and Other Challenging Assembly Analysis" was conducted by Dr. Philippe Perdu, Senior Expert (CNES, France) and Adjunct Senior Principal Research Scientist (TL@NTU). Another technical talk titled "Research Progress of Electro-

migration (EM) and Thermomigration (TM) in Solder Interconnects" was co-organized with the School of Materials Science and Engineering, NTU. The talk was given by Prof. Y.C. Chan and Mr. Ze Zhu from the City University of Hong Kong and was held on August 1, 2017 at NTU.

The Learning Journey

The Chapter has organized social events for underprivileged children in recent years, with all expenses paid for by the Chapter. This year the chapter is planning to organize a technical knowledge sharing session at the Chen Su Lan Methodist Children's Home on November 24, 2017. Called "The Learning Journey", we expect a participation of 40 children. Together with our Student Committee from SUTD, there will be a 2-hour technical workshop session followed by games and activities. The learning kits to be used in the technical workshop will be donated to the Home for continuous learning after the activities. Special thanks to SUTD for their kind donation. We hope to build interest in Engineering within this group of children and encourage them to aspire to be future engineers.

ED/SP/E/PE Indonesia Joint Chapter

—by Basuki R Alam

On December 16, 2016, the chapter held a Distinguished Lecture (DL) by Prof. Mansun Chan from HKUST, Hong Kong at the Microelectronic Center Convention Room, Institute of Technology Bandung, West Java, Indonesia. The DL was titled "What should we do at the end of Moore's law" and was attended by 60 people consisting of students, faculty and research staff member from ITB and a few participants from nearby Polytechnics and a IC design house. Prior to the topic of lecture, Prof. Mansun Chan gave an overview of the IEEE and the Electron Device Society (EDS) covering Region 10 chapters and sponsored programs,

especially regional conferences, humanitarian and educational programs. After the introduction of IEEE EDS and HKUST, Prof. Chan delivered the main topic of the lecture. The final course to the end of Moore's Law is gate dimensions reaching 10 nm and less, which has led to the change in semiconductor device research to new technology, emerging devices, materials and heterogeneous integration, as well as packaging technology such as 3D chip integration. Prof. Chan further explained the result of low-k dielectric research of porous dielectric including VACP (vertically aligned cavity pores) using CNT in carving vertical cavities for a porous dielectric. In the afternoon, Prof. Chan had a special session with undergraduate and post-graduate students by elaborating on the running the IEEE Xplore Camp program with an example on early age electronics introduction.

ED Indonesian Chapter also held a Distinguished Lecture (DL) of Dr M.K. Radhakrishnan, titled "Semiconductor Device Progression and Challenges in



DL of Prof. Mansun Chan at ITB

Nano devices" on October 16, 2017 at the student center of ITB. The DL drew a large audience of more than 170 students, faculty, researchers and industrialists. The Indonesia Chapter Chair, Dr. Basuki R. Alam, commenced the DL with an opening remark to welcome Dr. Radhakrishnan. Dr. Radhakrishnan then lectured on nano scale state of current CMOS technology and some related reliability issues. The DL highlighted insights on the nanometer dimension of the MOSFET structures and the technology glitches related to nanostructures of the FETs. At the end of the DL session, Dr. Rad-

hakrishnan also gave an overview of IEEE, ED Society and benefits of being regular and student member. Overall, the DL and IEEE EDS introduction was remarkably beneficial for the newly established EDS Indonesia Chapter.

ED Malaysia Kuala Lumpur Chapter & ED UKM SB Chapter

—by Rosminazuin A Rahim, Mohd Nuriman, Asrulnizam & Aliza Aini Md Ralib

DL Talk by Prof Vijay K Arora

ED Malaysia and the ED UKM Student Branch organized the EDS



DL of Dr. Radhakrishnan at ITB



Participants of the DL talk of Prof Vijay Arora at IMEN UKM and ITMA UPM



Participants and committee members are happy to be involved in the event

Distinguished Lecturer (DL) talk by Prof. Vijay Arora on December 14, 2017 at the Institute of Microengineering and Nanoelectronics (IMEN) Universiti Kebangsaan Malaysia and at ITMA UPM. The talk on “Graphene Electronics” successfully attracted 20 participants from IMEN and ITMA, and postgraduates and researchers from UKM and UPM. Prof. Vijay comprehensively explained the cohesive bandstructure as unique boundary conditions are applied to graphene rolled in to a carbon nanotube and small-width graphene nanoribbons, transforming graphene from a 2D to 1D nanostructure. The transformed density of states and both the equilibrium and nonequilibrium distribution functions define the carrier statistics and transformations of randomly oriented velocity vectors to streamlined ones in extreme non-equilibrium.

Electronics Magic! on IEEE Day

Electronics Magic! was an education and a community service event organized by ED Malaysia Chapter and sponsored by IEEE Region 10 EA Fund and IEEE Malaysia Section. In the spirit of leveraging technology for a bet-

ter tomorrow, the event was aimed to share the world of electronics with underprivileged children at Sekolah Bimbingan Jalinan Kasih through Science, Technology, Engineering and Mathematics (STEM) learning using IEEE EDS-ETC kits. Located in Chow Kit, Kuala Lumpur, Sekolah Bimbingan Jalinan Kasih is a unique school designed by the government of Malaysia for street children by giving them access to education. The event is conducted in conjunction with IEEE Day celebration at International Islamic University Malaysia (IIUM) with an objective to show to the students that everything around them in their daily lives are all somehow connected to electronics. This shows how important electronics are and they also can be part of community of people who work on electronics in the future. The number of attendees was 50, including 26 underprivileged children, IEEE members and committee members. The event is supported by IEEE EDS members, IEEE Malaysia Section members, staff and post-graduate students of Kulliyah of Engineering, IIUM and representatives from Persatuan Saintis Muslim Malaysia (PERINTIS).

Technical Talks

A series of technical talks were organized by EDS Malaysia and EDS UKM SB. They are as follows:

- 1) Profesional talk by Intel Malaysia Design Center (MDC), Layout Design Engineer at IIUM titled “Intel Malaysia Overview— Semiconductor & Silicon Design” and “Intel Memory Technology Overview” (October 13, 2017).
- 2) Technical Talk by Prof. Matthieu Chatras from XLIM France at IIUM titled “RF MEMS Research activities in XLIM France” (November 14, 2017).
- 3) Technical Talks by Dr. Norhayati Soin at UMS and UNIMAS titled “MEMS Reliability Challenges in Nanoelectronics Era” (October 4 and November 17, 2017).
- 4) Technical Talk by Prof. YP Lee from Hanyang University Seoul Korea at IMEN, UKM titled “Advanced Electromagnetic Materials and Applications: Metamaterials” (December 5, 2017).
- 5) Technical Talk by Prof. Abdelkrim Khelif from CNRS France at IMEN, UKM titled “Spatial Confinement of Surface Phonons in Micro Resonators” (December 22, 2017).



EDS Technical talks at various institutions



Participants of EDS-ETC at IMEN UKM

EDS-ETC at IMEN, UKM

An EDS-ETC program was held for students of SMK Abdul Rahman Yaakob Bota Perak on December 19, 2017 in conjunction with IMEN's 15th Anniversary celebration. The goal of the program is to enable EDS chapter members to host events designed to engage young students in the field of electrical and electronic engineering. A total of 60 participants (38 secondary school students, 6 teachers, 16 volunteers from IMEN) participated in the event. The students' feedback were positive in that they could understand the basic theory by constructing simple electronic circuits.

EDS UKM SB organized another EDS-ETC event on November 30, 2017 for a total of 27 international primary school kids, at JKEES, UKM. The students' feedback were positive in that they could understand the basic theory by constructing simple electronic circuits.

EDS-ETC by USM

Universiti Sains Malaysia (USM) in collaboration with Sains@USM, Pulau Pinang State Education Department, Academy of Sciences Malaysia, Collaborative Microelectronic Design Excellence Center (CEDEC) and local schools organized several EDS-ETC programmes in the northern region on November 14 and 23-24, 2017. This program was designed to stimulate student interest and drive passion towards STEM by creation of innovators skill and culture. This program gave an exciting exposure to the students in constructing simple circuits while learning about electrical theory fundamentals. Each programme comprised of 30-160 school students, undergraduate and postgraduate students from schools and universities.

-P Susthitha Menon, Editor

ED Nepal Chapter

—by Bhadra Prasad Pokharel

On August 31, 2017, the chapter organized a talk by Dr. Subin Adhikari, GoldenGate Int'l College, Kathmandu on "Computational Material Science Research in Nepal-Prospective and Introduction to Density Functional Theory," at Goldengate Int'l College, Battisputali, Kathmandu. He presented solutions to the Kohn-Sham equation using different wave-functions as pseudo-potential (PSP), projector augmented wave (PAW) and linear augmented plane wave (LAPW) formalisms.

On September 15, 2017, Dr. M. K. Radhkrishnan, EDS Vice President of Regions and Chapters, gave a DL talk on the topic of "Semiconductor Technology Progression and 50 Years of Moore." The program was partially supported by Central Department of Physics, Kirtipur and was attended by over 60 delegates.



Participants of EDS-ETC at USM



CAS/ED Chapter, Hyderabad Section

—by Mohammed Arifuddin Sohel

The joint chapter of the CAS/ED Societies organized the second IEEE CAS/ED Research Forum at Hotel Kamat Lingapur on Sunday, July, 2, 2017. The inaugural session was presided by Dr. Alex James, Chair, IEEE Kazakstan subsection and Dr. M. Lakshminaryana, Chair, IEEE Hyderabad section. The first talk was on “How to Choose a research Topic and do Literature survey,” by Dr. Atul Negi, Professor, University of Hyderabad, which was followed by a very invigorating keynote talk by Dr. Manoj Saxena, IEEE EDS R10 SRC Vice Chair, on research opportunities in area of electron devices and motivated the participants to choose this area for doing research. In the post lunch session, Dr. Arif Sohel gave a brief presentation on benefits of an IEEE membership. This was followed by a talk on “Use of LaTeX” software for technical writing, presented

by Dr. Rahul Thothatil, Analog Design Engineer, AMS semiconductors India Pvt. Ltd. The next talk was on “Research opportunities in Circuits and Systems” by Prof. Alex Pappachen James, Chair, Electrical Engineering Department, Nazarbayev University, Kazakhstan. Mr. A.G. Krishnakanth, Secretary, CAS/ED chapter, gave a talk on “Effective conference presentations” and Dr. Kaleem Fatima, Chair, CAS/ED chapter, gave a talk on “Best practices in Thesis writing”.

The CAS/ED Chapter of the IEEE Hyderabad section inaugurated a student branch of the CAS chapter in Auroras Group of Institutions (AGI) on July 6, 2017. Dr. Arif Sohel, Vice Chair of the CAS/ED Chapter, gave a technical talk on Analog VLSI Design which was attended by over 250 students.

The chapter organized a three-day CAS Membership Development workshop on Internet of Things (IoT) in Collaboration with the ECE Department of Muffakham Jah College of Engineering and Technology on August 26–28, 2017.

The workshop was fully sponsored by IEEE CASS for an amount of USD 2000 under the CASS Outreach Program. Twenty-one teams of three students each from across states of Telangana and Andhra Pradesh participated in this workshop. Each participating team was presented with a take away IoT kit at the end of the workshop to enable them to build their own project after going back to their college and spread the message of IEEE CASS and encourage CAS memberships. IEEE student members, a total of 63, participated in the workshop. The workshop closed with a very interesting panel discussion on “Real IoT design and Career and entrepreneurial opportunities in IoT”.

ED Meghnad Saha Institute of Technology Student Branch Chapter

—by Manash Chanda and Swapnadip De

On July 21, 2017, the ED Meghnad Saha Institute of Technology (MSIT) student



Participants of IoT workshop with faculty and organizers

chapter, in association with the Department of ECE, MSIT, organized a DL talk on the “Evolution of Semiconductor Devices in Enabling Smart Environments and Integrated Ecosystems” by Prof. Samar Saha (DL), Jr. Past President, IEEE EDS and Adjunct Faculty, Santa Clara University.

A two-week summer training program on “VLSI and Embedded System” was organized by the ED MSIT Student Branch Chapter and MSIT Student Branch, and in association with the Department of ECE from July 17–30, 2017 in the Advance VLSI Design Lab. The program was organized to guide the Pre-Final year students towards advanced VLSI design and embedded systems. A total of fifty students attended the program, out of which twelve students were IEEE student members. A second IEEE EDS Membership Awareness Program was organized by the ED MSIT Student Branch Chapter on August 25, 2017 to encourage and motivate the students. Almost 80 students attended the membership awareness program.

The chapter in association with the Department of ECE, MSIT organized a one day IEEE EDS talk on “Promise of 2D Materials” by Prof. Saptarshi Das, Assistant Professor of the Department of Engineering Science and Mechanics, Pennsylvania State University,



Participating students in the Humanitarian activity: Fun of Mathematics, with the organizers

USA on December 22, 2017 at the Advance VLSI Design lab of MSIT.

ED University of Calcutta Student Branch Chapter —by Sarmista Sengupta and Soumya Pandit

On July 3, 2017, the ED University of Calcutta Student Branch Chapter organized a technical talk on “Micro-Scale Power Management Interface Circuits for IoT Node” by Dr. Saroj Mandal, Birla Institute of Technology, Hyderabad, India. The talk was focused on the development of on-chip switched-capacitor based DC-

DC converter for micro-scale energy harvesting systems.

On August 19, 2017, the chapter jointly organized an outreach program on “Magic of Mathematics” as a part of humanitarian activity at Sadhanpur Uludanga Tulsi Ram High School, Amdanga, North 24 Paraganas. The goal of the program was to build an interest in mathematics in young school students. The program was attended by over 60 attendees from students in classes VIII, IX and X.

On August 24, 2017, a DL talk by Prof. Anisul Haque, Chairperson, Department of Electrical and Electronic Engineering at East West University, Bangladesh was organized on the topic “Revisiting the Gate C-V Characterization for Advanced MOS Devices.” Measurement and modeling of C-V characteristics of state-of-the-art MOS devices were critically addressed in the talk.

On November 9, 2017, Dr. Yogesh Chauhan, IIT Kanpur delivered a DL talk on “Negative Capacitance MOS-FETs for Future Technology Nodes.” The talk covered the detailed physics of negative capacitance materials and was attended by over 50 research scholars and faculty members.

On December 12, 2017, the chapter jointly organized a technical talk on “VLSI Design of Cellular Automata (CA) based Coding” by Dr. Joydeb Bhaumik from Jadavpur University,



Group picture of IEEE EDS Technical Talk by Prof. Saptarshi Das

Kolkata, India. The talk covered the cellular automata (CA) approach for designing byte error-correcting codes.

ED Delhi Chapter

—by Sneha Kabra

On October 26, 2017, the ED Delhi Chapter, in collaboration with the Department of Instrumentation (Shaheed Rajguru College of Applied Sciences for Women), organized an invited talk by Professor R. S. Gupta, Chairman-ED Delhi Chapter on “Evolution of Electronics and VLSI Design.”

On November 10, 2017, the chapter organized a DL by Professor Vijay K. Arora on “Graphene Nanotechnology—Past, Present and Future” at the Department of Electrical and Computer Engineering, Maharaja Agrasen Institute of Technology, Indraprastha University. A National Seminar on “Recent Developments in Electronic Materials and Devices” was held on November 10-11, 2017, and which was supported by the ED chapter, the Society for Microelectronics and VLSI and DRDO, Government of India. Prof. Vijay Arora from Wilkes University, USA, explained the history and basics of graphene technology in his talk. Dr. Seema Vinayak from SSPL, DRDO explained in her lecture the properties of Gallium Nitride (GaN) Technology and the ways it was useful in the defense sector. Dr. Ramachandran Raman from SSPL, DRDO explained in his talk the various techniques used to study the properties of semicon-



Dr. Garima Gupta, Dr. S. Lakshmi Devi and Dr. Ranjana Singh in the inaugural session of the workshop

ductors such as Raman spectroscopy, electron microscope and X-ray techniques. He also explained the various ways in which semiconductors can be created. Prof Mridula Gupta, Department of Electronic Science, University of Delhi, in her lecture discussed the development of the various generations (1G to 5G) of mobile wireless technology along with their significance and advantages of one over the other. Dr. Yogesh Pratap of the Department of Instrumentation, Shaheed Rajguru College of Applied Sciences for Women, University Of Delhi discussed in his presentation the “Principles and Applications of Nanowire Field Effect Transistors with gate Material and Advance Channel engineering.”

The chapter and the Shaheed Rajguru College of Applied Sciences for Women organized a one-week Para-teaching Workshop from December 15–21, 2017, which was sponsored by UGC and DBT Star College Scheme. The aim of the workshop was to enhance the skills of Para-teaching staff employed in College and University departments across the country in various disciplines like electronics, physics, chemistry and biology. Forty-one participants from various colleges and universities across the country participated in the event. The program contents were chosen and structured to meet the needs of each of the target groups of techni-

cians and laboratory staff in universities and colleges.

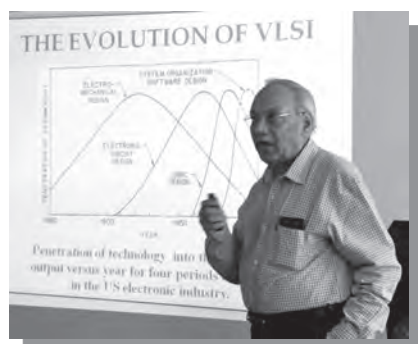
On December 20, 2017, an IEEE EDS Distinguished Lecturer on “Reliability Implications of Next Generation Nanoelectronic Devices,” was jointly organized by the chapter and IIT Delhi. Professor Durgamadhab Misra, New Jersey Institute of Technology, Newark, New Jersey, outlined some of the recent developments of high-k gate dielectrics on germanium and the challenges of obtaining an acceptable interface.

IEEE Bombay Chapter, IIT Bombay

—by Anil Kottantharayil

The IEEE AP/ED Bombay chapter organized four talks in IIT Bombay. Dr. Veeresh Deshpande, in his talk titled, “3D Monolithic Integration for advanced CMOS and towards neuromorphic systems,” mentioned the challenges faced by 2D planar integration of devices in terms of area scaling due to lithographic limitations and their efforts towards developing a 3D monolithic integration platform of InGaAs-over-Si(Ge).

Dr. Krishna Jayant in his talk, titled “Nanoelectrode Technologies for the Brain,” discussed targeted nanopipette recordings in dendritic spines, flexible nanopipette electrophysiology in vivo and CMOS nanoelectrode arrays. Dr. Jayant also gave a brief overview on his ongoing work on



Prof. R.S Gupta delivering the invited talk at Shaheed Rajguru College of Applied Sciences for Women



Dr. Veeresh Deshpande delivering his talk

biomimetic nanopipettes, scanning nanopipettes for super-resolution imaging, and custom CMOS amplifiers for enhanced intracellular recordings. Mr. Narsimha Kamath and Mr. Sreeharsha Srinivas in their talk titled, "Analog Devices in the IoT arena towards ubiquitous sensing" introduced Analog Devices, Inc. work in the IoT field and talked about their ultra low power micro-controllers that are targeted at spear-heading an era of ubiquitous sensing.

In his talk titled, "High-Voltage SiC power devices", Dr. Krishna Shenai discussed the current state-of-the-art

and future research opportunities in SiC power devices for a wide range of commercial and strategic power electronics applications.

ED Uttar Pradesh Section— Kanpur Chapter

—by *Yogesh Chauhan*

A Distinguished Lecture Program by Dr. M. K. Radhakrishnan, EDS Vice President of Regions/Chapters, NanoRel, Singapore, was organized by the Department of Electrical Engineering, IIT Kanpur, jointly with ED Chapter on September 18, 2017. He

delivered a lecture titled "Interface Physics and Analysis Challenges in Si Nanodevices."

In January 2018, the ASM-HEMT model, developed as a joint effort between Indian Institute of Technology Kanpur and Macquarie University, was selected as first industry standard SPICE model for GaN HEMTs. The ASM-HEMT model is a robust, surface-potential based compact model for Gallium Nitride (GaN) High Electron Mobility Transistors. The model was standardized following more than five years of rigorous research and development led by Profs. Yogesh Singh Chauhan and Sourabh Khandelwal. It has been selected for funding as an industry standard model by Si2-Compact Model Coalition (CMC), a conglomerate of key industry players encompassing the entire semiconductor industry supply chain including from EDA tool developers to foundries.

IEEE-ED NIT Silchar Student Branch Chapter

—by *T.R. Lenka*

On November 8, 2017, the ED NIT Silchar Student Branch Chapter, in



Participants of the EDS Distinguished Lecture at IIT Kanpur



Attendees of the EDS DL talk at NIT Silchar, (from left) Dr. Y. S. Chauhan (EDS DL: Third position), Dr. T. R. Lenka (Faculty Advisor, ED NIT Silchar SBC), Mr. Soumyaranjan Routray (Student Chair)

association with Dept. of ECE, NIT Silchar, organized a DL talk by Dr. Yogesh S. Chauhan, IIT Kanpur on "Compact Modeling of GaN HEMTs for High Frequency and High Power Applications". He provided insightful ideas on industry standard potential of HEMT and other III-Nitride devices for High Frequency and High Power Applications. On December 20, 2017, a DL talk by Prof. Vijay K. Arora, Wilkes University was organized on the topic "Research Methodology in Nanoscience."

ED NIST Student Chapter, Berhampur

—by Ajit K. Panda

The ED NIST Student Chapter, Berhampur organized a three-day workshop on "TIIC Tools" from December 19-21, 2017 at the National Institute of



Participants of "TIIC Tools" workshop

Science & Technology, Palur Hill, and Berhampur for the young researchers and faculty. Mr Abhishek Gupta, application engineer, Texas Instrument, demonstrated a few applications

based on different sensor modules and their interfacing with a local server to setup an IoT.

~ Manoj Saxena, Editor

EDS MEETINGS CALENDAR



THE COMPLETE EDS CALENDAR CAN BE FOUND AT OUR WEB SITE:

[HTTP://EDS.IEEE.ORG](http://eds.ieee.org). PLEASE VISIT.

<u>2018 International Symposium on VLSI Technology, Systems and Application (VLSI-TSA)</u>	16 Apr - 19 Apr 2018	Ambassador Hotel Hsinchu 188 Chung Hwa Road, Section 2 Hsinchu, Taiwan
<u>2018 International Symposium on VLSI Design, Automation and Test (VLSI-DAT)</u>	16 Apr - 19 Apr 2018	Ambassador Hotel Hsinchu 188 Chung Hwa Road, Section 2, Hsinchu, Taiwan Hsinchu, Taiwan
<u>2018 IEEE International Vacuum Electronics Conference (IVEC)</u> Abstract submission deadline: 22 Dec 2017 Full Paper Submission deadline: 22 Dec 2017 Final submission deadline: 02 Mar 2018 Notification of acceptance date: 02 Feb 2018	24 Apr - 26 Apr 2018	Monterey Marriott 350 Called Principal Monterey, CA, USA
<u>2018 29th Annual SEMI Advanced Semiconductor Manufacturing Conference (ASMC)</u> Abstract submission deadline: 09 Oct 2017 Full Paper Submission deadline: 05 Feb 2018 Final submission deadline: 02 Apr 2018 Notification of acceptance date: 06 Dec 2017	30 Apr - 03 May 2018	Saratoga Springs City Center 522 Broadway Saratoga Springs, NY, USA
<u>2018 7th International Symposium on Next Generation Electronics (ISNE)</u> Full Paper Submission deadline: 07 Feb 2018 Notification of acceptance date: 01 Mar 2018	07 May - 09 May 2018	GIS TAIPEI TECH Convention Center (Building Everlight)2~3F., Ln. 193, Sec. 3, Zhongxiao E. Rd., Da'an Dist., Taipei City 106, Taiwan Taipei, Taiwan
<u>2018 IEEE 30th International Symposium on Power Semiconductor Devices and IC's (ISPSD)</u> Abstract submission deadline: 31 Oct 2017 Full Paper Submission deadline: 31 Mar 2018 Final submission deadline: 31 Mar 2018 Notification of acceptance date: 31 Dec 2017	13 May - 17 May 2018	Palmer House Hilton 17 East Monroe Street Chicago, IL, USA
<u>2018 IEEE International Memory Workshop (IMW)</u>	13 May - 16 May 2018	Westin Miyako Kyoto 1 Awataguchi Kachocho,Higashiyama-ku Kyoto 605-0052 Kyoto, Japan

<u>2018 Baltic URSI Symposium (URSI)</u> Abstract submission deadline: 14 Jan 2018 Full Paper Submission deadline: 14 Jan 2018 Final submission deadline: 06 Apr 2018 Notification of acceptance date: 01 Mar 2018	15 May - 17 May 2018	Poznan Congress Center Glogowska 14 Poznan, Poland
<u>2018 IEEE International Interconnect Technology Conference (IITC)</u> Abstract submission deadline: 12 Jan 2018 Final submission deadline: 02 Feb 2018 Notification of acceptance date: 02 Mar 2018	03 Jun - 07 Jun	Marriott Santa Clara, CA, USA
<u>2018 IEEE 45th Photovoltaic Specialists Conference (PVSC)</u> Abstract submission deadline: 22 Jan 2018 Full Paper Submission deadline: 22 May 2018 Final submission deadline: 04 Jun 2018 Notification of acceptance date: 18 Mar 2016	10 Jun - 15 Jun 2018	Hilton Waikoloa Village 69-425 Waikoloa Beach Dr Waikoloa Village, HI, USA
<u>2018 IEEE Radio Frequency Integrated Circuits Symposium (RFIC)</u> Full Paper Submission deadline: 12 Jan 2018 Final submission deadline: 22 Mar 2018 Notification of acceptance date: 12 Feb 2018	10 Jun - 12 Jun 2018	Philadelphia Convention Center 1101 Arch St Philadelphia, PA, USA
<u>2018 IEEE Symposium on VLSI Circuits</u>	18 Jun - 22 Jun 2018	Hilton Hawaiian Village Honolulu, HI, USA
<u>2018 76th Device Research Conference (DRC)</u> Abstract submission deadline: 16 Mar 2018 Notification of acceptance date: 09 Apr 2018	24 Jun - 27 Jun 2018	University of California at Santa Barbara Santa Barbara, CA, USA
<u>2018 25th International Workshop on Active-Matrix Flatpanel Displays and Devices (AM-FPD)</u> Abstract submission deadline: 22 Mar 2018 Full Paper Submission deadline: 22 Mar 2018 Final submission deadline: 06 Jun 2018 Notification of acceptance date: 25 May 2018	03 Jul - 06 Jul 2018	Ryukoku University Avanti Kyoto Hall 31 Nishi Sanno-cho Higashi Kujo Minami-ku Kyoto, Japan
<u>2018 31st International Vacuum Nanoelectronics Conference (IVNC)</u> Abstract submission deadline: 26 Feb 2018 Final submission deadline: 24 May 2018 Notification of acceptance date: 09 Apr 2018	09 Jul - 13 Jul 2018	Kyoto Research Park 134 Chudoji Minami-machi Shimogkyo-ku Kyoto, Japan
<u>2018 International Flexible Electronics Technology Conference (IFETC)</u> Abstract submission deadline: 31 Jan 2018 Full Paper Submission deadline: 07 Feb 2018 Final submission deadline: 15 May 2018 Notification of acceptance date: 31 Mar 2018	07 Aug - 09 Aug 2018	Delta Hotels Ottawa City Centre 101 Lyon St N Ottawa, ON, Canada



EDS VISION, MISSION AND FIELD OF INTEREST STATEMENTS

Vision Statement

Promoting excellence in the field of electron devices for the benefit of humanity.

Mission Statement

To foster professional growth of its members by satisfying their needs for easy access to and exchange of technical information, publishing, education, and technical recognition and enhancing public visibility in the field of Electron Devices.

EDS Field of Interest

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.