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TECHNICAL BRIEFS

PHOTOVOLTAICS: TRANSFORMING THE ELECTRICITY INFRASTRUCTURE OF THE 21ST CENTURY



*Rajendra Singh
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The 1954 report of 6% efficient silicon solar cells by Chapin and co-workers at the Bell Laboratories [1] led to the use of photovoltaic devices for space applications. Oil embargo leading to the energy crisis of 1973 brought renewed interest in photovoltaics (PV) for terrestrial applications. In 1973, I decided to do my PhD thesis dissertation in the area of silicon solar cells and joined McMaster University as a graduate student in 1974. In the last 40 years, I have witnessed the phenomenal growth of the PV industry. In the energy sector, PV industry has the highest growth rate.

One hour of incident solar energy is equal to all the energy used in one year on our planet. Electricity generation by photovoltaics (PV), is going to revolutionize energy production in a manner similar to the role of computer chips in bringing about the information revolution. From both economic and environmental considerations, PV can provide sustained global economic growth. First objective of this note is to stress the emerging role of photovoltaics for sustainably powering underdeveloped, emerging, and developed economies [2]. The second objective of this note is to point out research directions that will further reduce the cost of PV modules and the electricity generated by PV.

As early as 1980, in a paper on the economic requirements for new materials for solar cells [3] it was predicted - based on the abundance of raw materials—that silicon was the best candidate. Over the last 34 years this prediction has been correct, and it is expected to remain true in the future. Current silicon PV market is slightly more than 90% and in the last few years, the contributions of other PV materials are decreasing. Based on the fundamental understanding

(continued on page 3)

YOUR COMMENTS SOLICITED

Your comments are most welcome. Please write directly to the Editor-in-Chief of the Newsletter at
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CONTRIBUTIONS WELCOME

Readers are encouraged to submit news items concerning the Society and its members. Please send your ideas/articles directly to either the Editor-in-Chief or appropriate Editor. The e-mail addresses of these individuals are listed on this page. Whenever possible, e-mail is the preferred form of submission.

NEWSLETTER DEADLINES

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

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

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PHOTOVOLTAICS: TRANSFORMING THE ELECTRICITY INFRASTRUCTURE OF THE 21ST CENTURY

(continued from page 1)

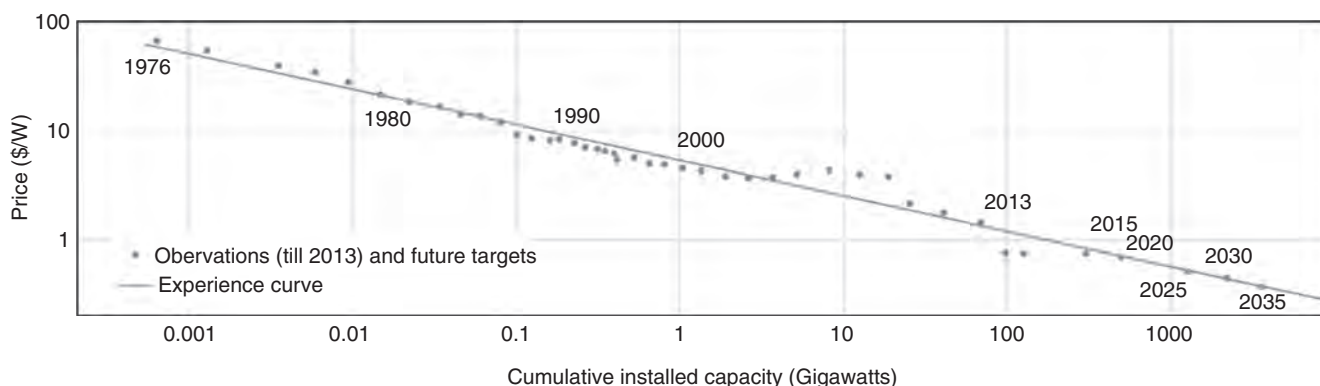


Fig. 1 Experience curve of doubling of PV module manufacturing and cost reduction by 20% and extension to 2035 [5].

about the role of dielectric-semiconductor and metal-semiconductor interfaces [4] and many other fundamental breakthroughs, Martin Green of the University of New South Wales reported 25% efficient silicon solar cells in 1999.

From 1980 onwards, every doubling of the generation capacity of PV modules has been accompanied by a 20% reduction in the selling price, as shown in Fig. 1 [5]. The soft cost (licensing, zoning, environmental impact fees, etc.) of PV generation systems is also being reduced and power-purchasing agreements as low as \$0.04/kWh are in place in USA [2].

Although batteries are not considered as solid-state devices, batteries are essential to store electricity generated by PV. Declining battery costs will also assist in the growth of PV-electricity generation. The manufacturing of batteries at Giga Watt scale by electric vehicle manufacturer Tesla has the potential to reduce battery costs to less than \$150 per kWh in 2017 [2].

PV modules generate DC power, and batteries also store DC power. Other than few loads involving some motors, virtually all our current loads operate on DC power. Significant power is lost in the conversion from DC to AC and back from AC to DC [6]. Without inverter the cost of the PV

system is lower and the reliability of the PV system is higher. The cost of electronics required to regulate battery power is also higher for AC powered DC loads. In place of conventional integrated grid, nanogrid (electricity generation, storage and distribution capabilities) and microgrid (can function like nanogrid, but also can exchange power with other microgrids or be part of the central grid), offers several advantages in cost, reliability, resiliency, and security [7].

As compared to the non-concentrator PV market, concentrator PV market is almost non-existent. This is due to the difficult engineering problems of optical system, heat removal, higher cost and system reliability problems. With clever designs, it is possible that, ultra-low concentration (~2–10 suns) based roof top (e.g. automobiles) applications may find a niche market.

Due to toxicity of cadmium and abundance related issues, both CdTe and CuInGaSe (CIGS) are not ideal thin film PV materials. First Solar, manufacturer of CdTe PV modules, employs vertically integrated business model (no middle man) and sell electricity in place of PV modules. For solar farms (land area is not an issue) amorphous silicon based PV modules using LCD manufacturing techniques

can provide ultra-low cost electricity. With the exit of Applied Materials and most recently Sharp, no major player is left in the amorphous Silicon PV module manufacturing. Thin films are very important for building integrated photovoltaics (BIPV) market. In reference [1] we have discussed at length, the manufacturing requirements of any photovoltaic device. One must pay attention to the unconstrained supply of materials, low variability of key processes, low production cost, environmental, health and safety issues and device and module's reliability [1]. Without solving fundamental problem of C-H bond breaking under normal solar radiations, organic PV devices have very limited scope for applications such as throw away products [1]. Similar reliability concerns exist for dye-sensitized solar cells.

With global installation of about 190 GW by the end of year 2014 [2], one has to carry out rigorous analysis about the future directions of research that will add value to the PV module manufacturing. In reference [1] we examined all the device concepts that are currently being explored by a number of researchers all over the world. Our conclusion was that none of these approaches will lead to any commercial product [1]. For increasing the efficiency

of silicon solar cells beyond 25%, we have to use multi-terminal multi-junction device architecture [1]. With a four terminal device, Cu_2O is identified as one potential material [1]. It is possible to identify other materials that may be better than Cu_2O , but the manufacturing requirements must be kept in mind.

There is lack of published work reporting new concepts for inventing new processing equipment. Manufacturing cost will be reduced by manufacturing tools that can provide lower process variability, higher throughput and lower capital cost [7].

In conclusion, PV and batteries are ready to transform the global electricity infrastructure. Microgrids and nanogrids of PV-generated DC electricity will enable this transformation. Like cell phones, monetary policy of quantitative easing can provide PV generated personal power to billions of people all over the world who have no access to electricity.

Link to Articles

[1] R. Singh, G.F. Alapatt, and A. Lakhtakia, "Device Design Opportunities and Challenges for Making Photovoltaics a Reality in Every Home," *IEEE Journal of the Electron Devices Society*, Vol. 1, No. 6, pp. 129–144, 2013.

[2] R. Singh et al., "Emerging role of photovoltaics for sustainably powering underdeveloped, emerging, and developed economies," *Proc. 2nd International Conference on Green Energy and Technology (IGET)*, 5–6 September, 2014, Bangladesh, <http://cennser.org/ICGET/> (In Press)

[3] R. Singh and J. D. Leslie "Economic requirements for new materials for solar photovoltaic cells" *Solar Energy*, Vol. 24, no. 6, pp. 589–592, 1980.

[4] R. Singh, M.A. Green, and K. Rajkanan, "Review of Conductor/Insulator/Semiconductor (CIS) Solar Cells," *Solar Cells*, Vol. 3, pp. 95–148, 1981.

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[6] R. Singh and K. Shenai, "DC Microgrids and the Virtue of Local Electricity," *IEEE Spectrum*, February 6, 2014: [online] Available: <http://spectrum.ieee.org/green-tech/buildings/dc-microgrids-and-the-virtues-of-local-electricity> (Accessed July 14, 2014)

[7] R. Singh, G. F. Alapatt and G. Bedi, "Why and How PV Will Provide

the Cheapest Energy in the 21st Century," *Facta Universitatis Series: Electronics and Energetics*, Vol. 7, No. 2, pp. 275–298, 2014.

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UPCOMING TECHNICAL MEETINGS

2014 IEEE INTERNATIONAL ELECTRON DEVICES MEETING (IEDM)

IEDM CELEBRATES 60TH ANNIVERSARY AS WORLD'S LEADING DEVICE CONFERENCE

This year is the 60th anniversary of the Electron Devices Society's premier annual technical conference, the IEEE International Electron Devices Meeting (IEDM), which spotlights more leading work in more areas of the field than any other conference. It will take place at the Hilton San Francisco Union Square Hotel from December 15–17, 2014.

The IEDM will be preceded by two all-day Short Courses on Sunday, December 14th. They are:

- **Challenges of 7nm CMOS**, organized by Hidenobu Fukutome from Samsung. This course begins with the circuit application requirements at 7nm then looks at the implications for devices, reliability, memory, and process integration.
- **3D IC Technologies**, organized by Eric Beyne of Imec. This course looks at the overall challenges for 3D system design and the key enabling technologies to overcome those challenges and deliver reliable 3D integrated systems. In addition, a series of 90-minute Saturday tutorial sessions will be held on the afternoon of Saturday, December 13th. **The tutorials are:**
 - *Physical characterization of novel materials and devices for logic and memory*, by W. Vandervorst and D. Cooper from Imec.
 - *Reliability characteristics of CMOS transistors post Si/SiO₂/poly-Si gate stack scaling*, by Eduard Cartier from IBM Research.
 - *Power Semiconductor Device Basics: History, Application and Physics*, by Ichiro Omura from Kyushu Institute of Technology.



- *Power Electronics for a Smart Energy Future*, by Johan Driesen from KU Leuven.
- *Nonvolatile Memories: Old and New*, by Jan Van Houdt from Imec.
- *Optoelectronics of Graphene and other 2D materials*, by Phaeton Avouris from IBM Research.

Special focus sessions at this year's IEDM will be held on the following topics:

- novel devices for specialty imaging applications.
- microsystems for personalized medicine.
- solid-state power devices
- devices and circuits for analog applications.

Overall, the 2014 IEDM will feature an increased focus on circuit and process technology interaction, energy harvesting, bio-sensors and bioMEMS, power devices, sensors, magnetics, spintronics,

two-dimensional electronics, devices for non-Boolean computing, and multiferroics.

These events are in addition to a technical program of some 220 presentations, with thought-provoking plenary talks, panel discussions, special sessions, IEEE/EDS award presentations and other events. The traditional IEDM luncheon address given by a notable industry figure will be held on Tuesday, December 16th.

The Plenary talks are as follows:

- *SiC MOSFET Development for Industrial Markets*, by John Palmour from Cree Inc.
- *Are 3D atomic printers around the corner?* by Enrico Prati from CNR IMM (Italy's Institute for Microelectronics and Microsystems).
- *Research into ADAS with Driving Intelligence for Future Innovation*, by Hideo Inoue from Toyota.

The evening panels are as follows:

- *60 Years of IEDM and Counting*, organized by Krishna Saraswat from Stanford.
- *The Semiconductor industry in 2024*, organized by Thomas Theis from IBM.

Also, an Entrepreneurs Luncheon co-sponsored by IEDM and EDS Women in Engineering will be held on Wednesday, December 17th. Kathryn Kranen, former President & CEO, Jasper Design Automation, will discuss how she led two start-ups to success, in each case transforming an emerging technology into a mainstream one. She did that with both Verisity Design, Inc. and Jasper Design Automation, Inc., both of which subsequently were acquired

by Cadence. She had been Chief Executive Officer at both companies. Ms. Kranen was awarded the ACE Lifetime Achievement Award in 2013 for contributions to the electronics industry.

Technical Program

Original papers will be presented in the following technical areas:

- **Circuit and Device Interaction** – CMOS platform technology and circuit-device interactions
- **Characterization, Reliability and Yield** – all areas of characterization, yield and reliability for both front- and back-end of the line
- **Display and Imaging Systems** – devices, structures, and integration for displays, imaging, and detectors
- **Memory Technology** – all memory-related technology topics, from novel memory cell concepts and integration schemes to fully integrated memories and manufacturing issues
- **Modeling and Simulation** – analytical, numerical, and statistical approaches to the modeling of electronic, optical and hybrid devices, their isolation and interconnection.
- **Nano Device Technology** – novel solid state nanoelectronic devices



- **Power and Compound Semiconductor Devices** – compound semiconductors (GaAs, InP, GaN, SiC, antimonides and their related alloys, etc.) with electronic and optoelectronic device applications
- **Process and Manufacturing Technology** – front-end, back-end and heterogeneous technology integration and packaging process modules for fabrication of logic, memory, and 3D integrated circuits in silicon and non-silicon technologies, as well as advanced semiconductor manufacturing topics

- **Sensors, MEMS and BioMEMS** – sensors, sensor networks, micro-electromechanical systems (MEMS), and bioelectronic devices

Further information

For registration and other information, visit the IEDM 2014 home page at www.ieee-iedm.org or contact the Conference Office at 19803 Laurel Valley Place, Montgomery Village, MD 20886, USA; tel. (301) 527-0900, ext. 2; fax (301) 527-0994; or email: iedm@his.com.

Follow the IEDM on Twitter and Facebook at the following links to receive updates:

- Twitter: http://twitter.com/ieee_iedm
- Facebook: <http://www.facebook.com/IEEE.IEDM>

The San Francisco area provides many attractions for visitors and we encourage attendees to explore them in the off hours of the conference. The IEDM committee members look forward to seeing you in December.

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2014 IEEE SEMICONDUCTOR INTERFACE SPECIALISTS CONFERENCE (SISC)

The 45th IEEE Semiconductor Interface Specialists Conference (SISC) will be held December 10–13, 2014, at the Bahia Resort Hotel in San Diego, California, immediately prior to the IEEE International Electron Devices Meeting (IEDM) in San Francisco. An evening Tutorial session, free to all registered SISC attendees, will be held on December 10th.

The SISC is a workshop-style conference that provides a unique forum

for device engineers, materials scientists, and solid-state physicists, to openly discuss issues of common interest. Principal topics are semiconductor/insulator interfaces, the physics of insulating thin films, and the interaction among materials science, device physics, and state-of-the-art technology. Emphasis is placed on current and future nano-scale device architectures, and how interfaces between dissimilar materials and ultra-thin films affect

device operation where theory, modeling/simulation, and characterization results are used to help understand the impact on device performance and reliability. The conference alternates between the East and West Coasts, and meets just before the IEDM to encourage the participation of IEDM attendees. SISC is sponsored by the IEEE Electron Devices Society.

An important goal of the conference is to provide an environment

that encourages interplay between scientific and technological issues. Oral sessions of invited and contributed talks, as well as a lively poster session, are designed to encourage discussion. Conference participants have numerous opportunities for social gatherings with renowned scientists and engineers. They also enjoy the local attractions such as Old Town San Diego, SeaWorld, Pacific Beach and a wide range of fine dining.



San Diego attractions are within easy reach from the Bahia Resort Hotel

Conference focus

The program includes about 70 presentations from all areas of MOS science and technology. The topics evolve with the state-of-the-art, and include:

- **High-k gate dielectrics and SiO₂** on Si and their interfaces
- **Insulators on high-mobility and alternative substrates** (SiGe, Ge, III-V, GaN, etc.)
- MOS gate stacks with **metal gate electrodes**
- Stacked dielectrics for **non-volatile memory**
- **Oxide and interface structure**, chemistry, defects, passivation: theory and experiment
- **Electrical characterization, performance and reliability** of MOS-based devices
- **Surface cleaning technology** and impact on dielectrics and interfaces
- Dielectrics on **nanowires/tubes, graphene**
- **Oxide electronics and multi-ferroics**
- **Interfaces in photovoltaics**, e.g. Si passivation
- **2D materials and devices** and their interfaces

Invited presentations

This year's invited presentations will include:

- **Prof. Kevin Chen**, Hong Kong University of Science and Technology, Hong Kong, *Dielectric/III-N Interfaces with Nitridation Interlayer for GaN Power Electronics*

- **Dr. Luigi Colombo**, Texas Instruments, USA *2D Materials Growth and Prospects*
- **Dr. Jacopo Franco**, Imec, Belgium *Reliability challenges of high mobility channel technologies: SiGe, Ge and InGaAs*
- **Prof. Roy Gordon**, Harvard University, USA *Single-crystal oxide insulators grown epitaxially on GaAs, Ge and GaN by ALD*
- **Dr. Jan Van Houdt**, Imec, Belgium *Memory technologies for the terabit era: a paradigm shift*
- **Prof. Ali Javey**, UC Berkeley, USA *Contact engineering, chemical doping and heterostructures of layered chalcogenides*
- **Prof. Kousuke Nagashio**, University of Tokyo, Japan *Carrier response in electric-field-induced bandgap of bilayer graphene*
- **Dr. Tun-Wen Pi**, National Synchrotron Radiation Research Center, Taiwan *High k oxides on (In)GaAs surfaces studied by synchrotron radiation photoemission*
- **Prof. Thomas Schroeder**, IHP (Frankfurt/Oder), Germany *From global and local Ge integration approaches on Si(001): Novel insights by advanced synchrotron XRD techniques*
- **Prof. Max Di Ventra**, UCSD, USA *Memcomputing: computing with and in memory*

- **Prof. Ken Uchida**, Keio University, Japan *Evaluation of thermal properties of nanoscale MOSFETs and thermal aware device design of nano devices*

Wednesday evening Tutorial – free to all registered SISC attendees

- **Dr. Perrine Batude**, CEA-LETI, France – *3D monolithic integration: an alternative path towards CMOS scalability*

Unique poster program

A unique feature of SISC is the attention paid to the poster presentations. Each author of a poster presentation has the opportunity to introduce their work orally, using two visuals, to the entire SISC audience during special poster introduction sessions. The posters are then presented during a separate poster reception on Thursday evening with the second poster session on Friday afternoon followed by the Conference banquet.

Best Student presentation award

SISC is a popular conference with students, who can get immediate and candid feedback on their latest results from the experts in the field. In addition to a strongly reduced registration fee for students, a Best Student Presentation award is given every year in memory of E.H. Nicollian, a pioneer in the exploration of the metal-oxide-semiconductor system who had a strong presence within the SISC.

Accompanying program

The scientific content of the conference is complemented by informal events designed to encourage lively discussion and debate. A hospitality suite with complimentary drinks is available to attendees to continue their discussions on every evening of the conference. On Friday evening the conference hosts a banquet and awards ceremony, complete with the now-famous (and

always riotous) limerick contest. The limericks never fail to give the conference presentations, people and events an entirely new perspective.

SISC is always a rewarding experience for specialists, students, as well as newcomers to the field. For more information about the conference, to consult its program and to register, please visit <http://www.ieeesisc.org>. We look forward to seeing you at SISC 2014!

*Alex Demkov
2014 SISC General Chair
University of Texas at Austin, USA*

*Peide Ye
2014 SISC Program Chair
Purdue University, USA*

*Valeri Afanas'ev
2014 SISC Arrangements Chair
KU Leuven, Belgium*

2015 IEEE International Symposium on Power Semiconductor Devices and ICs (ISPSD)

The 27th IEEE International Symposium on Power Semiconductor Devices and ICs (ISPSD), sponsored by the IEEE Electron Devices Society and technically co-sponsored by the IEEE Power Electronics Society, will be held at Kowloon Shangri-La, Hong Kong, May 10–14, 2015. ISPSD is the premier forum for technical discussion in all areas of power semiconductor devices and power integrated circuits. Topics of interest include: Device Physics, Device Design, High Frequency Devices, High Power Devices, Smart Power Devices, RF Power Devices, Safe-Operating Area, Reliability, and ESD; Process Integration, Doping Technology, Lifetime Control, Passivation, and Crystal Growth; Device Modeling and Circuit Simulation, Layout, and Verification Tools; Si, GaAs, SiC, GaN, and Diamond Materials; Isolation Techniques, SOI, Power IC Design, Device Technology, Energy Capability and SOA, Reliability, Power SoC, and Monolithic vs Hybrid Integration; Novel Packaging Concepts, Power SiP, Stress and Thermal Analysis, and Thermal Management; Hybrid Vehicles, Computer and Telecom Power, Motor Drives, and Utility Applications.

With the Society's awareness in renewable energy and energy efficiency, power semiconductor devices and power ICs have become a focal point



as a key enabling device technology to help solve the world's energy challenge. ISPSD 2015 will have an expected attendance of 400–500 researchers from industries, universities, and research institutions all over the world. Traditionally more than 70% of ISPSD attendees are engineers and technical managers from the power semiconductor industry. More recently, representatives from CMOS foundries and power electronics design firms are also drawn to the conference.

ISPSD 2015 will commence with a popular one-day tutorial program on topics such as WBG devices in harsh environment, power ICs for use in automotive applications, high temperature packaging technologies, impact of power grid and connection of renewable energy sources, and advances in power conversion for mobile computing.

The conference will feature several plenary talks given by world renowned experts and a collection of high quality technical presentations. A poster session will also be organized to offer an even closer interaction among the attendees. Several social functions

have been planned to make the experience more unique and enjoyable.

ISPSD 2015 will mark the first time Hong Kong hosts the symposium. As the gateway of China and the

Asia's world metropolis, Hong Kong is characterized by a fusion of eastern and western cultures and a vibrant lifestyle. Kowloon Shangri-La is one of the most prestigious hotels in Hong Kong and also the winner of the TripAdvisor Travelers' Choice® Award 2014. With its 5-star facilities and services, and a magnificent view of world famous Victoria Harbour and the stunning lights of the city, the hotel provides an ideal atmosphere for an exciting yet informative symposium. Its convenient location also enables guests to visit many of the local attractions, enjoy shopping and dining, and explore other cultural and entertainment activities within walking distance. Additional information about ISPSD 2015 can be found at www.ispsd2015.com, or by contacting Prof. Johnny Sin of the Hong Kong University of Science and Technology, ISPSD 2015 General Chair (eesin@ust.hk). On behalf of the ISPSD 2015 Organizing Committee, I look forward to meeting you in Hong Kong.

*Phil Mawby
2015 ISPSD Publicity Chair
The University of Warwick
Coventry, UK*

2015 IEEE International Reliability Physics Symposium (IRPS)



IRPS has been the world's premier conference for pioneering work in semiconductor device reliability for 53 years. The next IRPS will be held at the Hyatt Regency Monterey Resort and Spa in beautiful Monterey, California, April 19–23, 2015. The first two days consist of tutorials in four different technical tracks presented by experts in the field followed by “reliability year in review” talks. The technical program begins on day three preceded by two keynote presentations and consists of three days of three track presentations with an evening lively poster session. Additionally, six workshops and a panel discussion will be held for selected topics with exhibitors attending as well.

Why IRPS?

It is also the only comprehensive reliability conference covering the breadth of device reliability from time dependent dielectric breakdown testing and models to compound device reliability to interconnect electro-migration to soft error to electronic system reliability to process integration to chip-package interaction. The topic areas are BEOL dielectrics, chip-packaging reliability, circuit aging/circuit reliability, compound device/opto-electronics, electronic system reliability, gate dielectrics reliability, interconnect metallization, memory, process integration, product IC reliability, soft error, and transistor reliability physics. It is the only conference with a full breadth of reliability topics where one can network with industry professionals

working on actual product reliability issues as well as university topics in reliability physics. IRPS is where the world of reliability physics and reliability engineering discussions occur. This conference is ideal for industry professionals to both broaden and deepen their knowledge while networking with others whether just starting their career or a seasoned reliability veteran. It is also ideal for students to discover the exciting area of reliability engineering!

BEST of IRPS14

IRPS14 was kicked off by keynote presentations from Raj Master from Microsoft and Charles Bergan from Qualcomm. The audience was certainly energized with these diverse perspectives!

The IRPS14 best paper, outstanding paper, best student paper, and best poster winners were voted on by the attendees and the management committee wishes all congratulations as they were selected out of 225 oral and poster presentations. IRPS14 best paper is “*Electromigration Failure of Circuit – Like Interconnects: Short Length Failure Time Distributions with Active Sinks and Reservoirs*,” by A. Oates and M.H. Lin from TSMC Ltd. Electro-migration failure rate for via terminated segments connected to sinks and reservoirs which is a common feature was found to be higher and model created to account for this. The IRPS14 outstanding paper is “*A Unified Perspective of RTN and BTI*,” by Tibo Grasser, K. Rott et al. from TU

Wien, Infineon, and IMEC. This paper presented arguments for similar defects causing random telegraph noise (RTN) and bias temperature instability (BTI) which would lead to a need to guard band against both types together. IRPS14 best student paper is “*A New Spectral Approach to Modeling Charge Trapping/Detrapping in NAND Flash Memories*,” by G.M. Paolucci et al. from Politecnico di Milano. A method was created which allows developing and monitoring accelerated schemes able to mimic realistic on-field usage of the memory device validated by experimental data. IRPS14 best posters were “*Voltage-Dependent Random Telegraph Noise (RTN) in HfO_x Resistive RAM*,” by S. Balatti et al. from Politecnico di Milano & Micron Technology Inc. and “*High-Voltage Double-Pulsed Measurement System for GaN-Based Power HEMTs*,” by D. Bisi et al. from University of Padova.

Please follow on Twitter @IEEEIRPS and see <http://IRPS.org> for latest information and we look forward to seeing you in Monterey!

Giuseppe LaRosa
2015 IRPS General Chair
IBM

Chris Connor
2015 IRPS Vice Technical Program
and Publicity Chair
Intel

Yuan Chen
2015 IRPS Technical Program Chair
NASA

SOCIETY NEWS

MESSAGE FROM EDS PRESIDENT-ELECT



Samar Saha
EDS President-Elect

The IEEE Electron Devices Society (EDS) is the home for a community of engineers, scientists, and other professionals with a vision to *promoting excellence in the field of electron devices for the benefit of humanity*. As a member-driven volunteer-led organization, the strength of EDS is its members and as President-elect of the Society, my commitment is to promote its mission 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*.

To fulfill its mission, the EDS offers its members a broad range of technical activities. It publishes three solely Society sponsored journals and a Newsletter along with several other co-sponsored publications, organizes a number of conferences, and offers symposia and workshops of different topical areas of the Society's field-of-interest (FOI). EDS also supports educational opportunities through programs like *Tutorial, Webinar, and Student Fellowship*. Other activities include *Distinguished Lecturer (DL) Program, Best Paper Awards* (Paul Rappaport and George Smith), *Education Award*, and *Distinguished Service Award*. In addition, EDS recently has established the *EDS Mission*

Fund of the IEEE Foundation to greatly enhance the humanitarian, educational, and research initiatives of the Society, by providing members and other constituents of the EDS community with the ability to contribute directly to our mission-driven imperatives, including programs like *EDS-ETC* and the *EDS Student Fellowship*. The Society's projects offer special opportunities for its members and chapters. All our members are invited to take full advantage of these attractive opportunities to promote the Society's vision.

The key resource of EDS is its members. In order to sustain and broaden EDS activities, the Society needs the involvement of its members. In this context, I invite EDS members to become active volunteers and participate in all key areas of endeavors. The Society encourages its members to participate in its technical committees, governing bodies, and editorial board of its journals. Technical committees provide the exchange of technical information, dissemination of ideas, and initiation of emerging topical areas and initiate ideas for special sessions of conferences, emerging topics of workshops and seminars, and special issues of EDS journals. The existing technical committees would benefit from new members and new initiatives and I encourage members to build strengths in emerging technical areas and lead efforts towards the creation of new technical committees. The members are also encouraged to actively

participate and initiate new activities through their local chapters. Apart from active involvement in technical activities within the technical and other committees and chapters, the Society needs new elected volunteers to run its operation. The Society elects its governing body called Board of Governors (BoG) annually. I strongly encourage each member to participate in the election process.

The Society's vision, *promoting excellence in the field of electron devices for the benefit of humanity*, also encompasses networking among the global EDS community of engineers, scientists, and other professionals to provide insights, ideas, and approaches for the advancement of the future. The EDS global community, today, comes together through webinar, tutorials, conferences, social media, professional networks, and many other venues with ongoing commitment for the benefit of humanity.

In summary, EDS offers all its members a great opportunity to be involved, active, and participate at the technical level or in its governance. The Society needs volunteer support, time, and talent. I invite each and every member of EDS to participate in all key areas of endeavors to advance EDS and its field to benefit not only EDS but the humanity as a whole.

Samar Saha
EDS President-Elect
Ultrasolar Technology
Santa Clara, CA, USA

MESSAGE FROM EDS VICE PRESIDENT OF MEMBERSHIP AND SERVICES



Mikael Östling
EDS Vice President
of Membership and
Services

I'm happy to address you all as the new EDS VP for membership and services. Being an IEEE/EDS member for the past 30 years, I really appreciate what this society can do for us members but

also to look for what the members can do for their EDS colleagues.

As for all professional societies our primary concerns are the member benefits. What's encouraging is that EDS is one of the IEEE's largest societies and the good news is that we have been able to keep our member count constant over the past few years when many other societies see marked decline in membership. We have a steady member count of just over 10,000 members. Well, this is not good enough for EDS, we want increasing numbers. Very positive is that our Student Member numbers are increasing as well as the Affiliate Member count.

Over the recent years we have launched a couple of activities that provides added values for our members. In 2011, the EDS Webinar Series came on line and delivers live lectures with luminaries from the field of electron device engineering... streaming right to your desktop!

Here are some tentative topics for upcoming webinar events:

- Plagiarism/authorship/copied work/research fraud
- Graphene and 2D Materials
- 3D Integration and ESD
- Bio integrated electronics
- Internet of Things

If there's a topic you'd like to see covered by one of our webinars, please let us know at eds@ieee.org. We will be happy to hear from you.

Also included in the membership is access to the EDS Webinar Archive where we recently had several hot technology topics such as *"CMOS Device Scaling – Past, Present and Future"* by Yuan Taur; *"FINFET"* by Chenming Hu; *"Circuits on Cellulose: From Transistors to LEDs, from Displays to Microfluidics on Paper"* by Andrew Steckl. In addition, a whole range of career advice seminars can also be found in the archive. Just to mention a few recent ones: *"Optimize Your Career through Graduate School"* by Mark Law; *"Working Successfully in the Semiconductor Industry"* by Doug Verret and *"Reflections on the Gentle Art of Teaching and Mentoring"* by John Cressler.

The IEEE has scheduled a special membership promotion at the beginning of October to encourage chapters to recruit new members and plan a local celebration for IEEE Day (7 October 2014)—a day commemorating the first time IEEE members gathered to share their technical ideas in 1884. This promotion gives new members US\$30 off their first year of IEEE Membership. This special discount can also be used as an opportunity to recruit new EDS members. Using the online membership application, they would simply add the Electron Devices Society to their Shopping Cart before Checkout (an additional charge of US\$18 EDS membership would be added to their total due).

Notices were sent to EDS chapters regarding several promotional campaigns such as the EDS Membership Fee Subsidy Program, which is A One Time Offer per Member—Free IEEE and EDS Memberships for new or renewing members of chapters located in developing nations. That was successful and resulted in a total of 120 New EDS Members for

2014. Last November an EDS Webinar Recruitment e-mail promotion was run with Complimentary EDS membership to IEEE member attendees of EDS webinars. We continue to run our Membership Campaigns and Exhibits at premier IEEE EDS sponsored conferences.

During the EDS Board of Governors Meeting (BoG) in May 2014, we had an interesting discussion at the membership and services committee with ideas on how to increase the member benefits. Some of the conclusions were to continue to focus on young professionals and affiliate members, focus on on-line membership and improve the way we promote the Society at events such as EDS Distinguished Lectures (DLs). We will also continue the focus on webinar offerings

It was also recommended to strongly promote the EDS anniversary book *"Guide to State-of-the-Art Electron Devices,"* edited by Professor Joachim N. Burghartz, with contributions by more than 50 EDS members. This book recently won the PROSE award and marks the 60th anniversary of the IRE electron devices committee and the 35th anniversary of the IEEE Electron Devices Society.

Most importantly though is what you as an EDS member thinks about the member benefits that you get from the Electron Devices Society. Please get in touch and tell us your ideas on what you expect and want to see with your EDS. You are all invited to share your ideas. You can preferably do this by e-mail to Joyce Lombardini, who is the EDS Membership Administrator, E-mail: j.lombardini@ieee.org

Sincerely yours

Mikael Östling
EDS Vice President of
Membership and Services

MESSAGE FROM EDITOR-IN CHIEF



*M K Radhakrishnan
Editor-in Chief
EDS Newsletter*

Dear Readers,

Through this column in the July 2014 issue of the Newsletter I requested young professionals to write into our new section intended for those who are less than 10 years

in their professional career after graduation. All our members in the EDS community are eager to hear their views. In this context, our YP member in the BoG, Daniel Camacho has interviewed another YP, Kyle Montgomery, which is given in this issue. The way EDS and its many wings benefited in the professional development is

expressed. We would like to hear more from our YPs and I am sure such intriguing information will be of high value to the growth of the Society.

In the Technical Briefs section in this issue we have an article by Rajendra Singh who is honored by the White House as Champion of Change for Solar Deployment. Again, photovoltaics take another mainstream news. In our Chapter News section, we are trying to highlight those Chapters who perform differently in many ways including those services to the society and humanitarian needs. Many such activities are getting unnoticed. In this issue, we are giving a short article on the Art of Failures, through which the depiction of the artistic mind of analysts

are portrayed, while they perform the high precision physical analysis on devices. From the Newsletter editorial team we request all Chapter Chairs as well as members to inform us about all such extraordinary activities of the members and groups.

Readers' feedback is the most valuable tool in the growth of any magazine. We need to hear from our members, and our editorial team is eager to receive the constructive criticisms. Please use the e-mail edsnewsletter@ieee.org to convey your ideas and feedback.

*M K Radhakrishnan
Editor-in Chief, EDS Newsletter
NanoRel, Bangalore, India
e-mail: radhakrishnan@ieee.org*

REPORT ON THE EDS 2014 REGION 8 CHAPTERS MEETING

The EDS Region 8 Chapters Meeting was held on Sunday, May 25, 2014, in conjunction with the Society BoG Meeting at KTH Royal Institute of Technology, Stockholm, Sweden. The

Chapters Meeting was Chaired by R8 SRC Vice-Chair, Ali Rezazadeh and attended by R8 SRC Vice-Chairs Simon Deleonibus and Benjamin Iniguez. Chapter Chairs/Representatives also

attended the meeting with nine chapters providing stimulating discussions on the activities of Region 8 and their future aspirations.

Ali Rezazadeh gave a summary report of Region 8 EDS chapters and major activities in the past year, including highlighting the role and function of the EDS R8 SRC Subcommittee in providing help and support for the Chapter Chairs. Region 8 remains one of the most active and growing regions in EDS. In the past year two new Chapters were formed in the United Kingdom and Republic of Ireland (UK&RI) Section: EDS/Photonics Ireland, (Chair: Patrick McNally) and EDS Scotland (Chair: David Cumming) including EDS/MTTS University of Manchester Student Chapter (Chair: Emerson Siningga). In addition, the EDS Romania Section Chapter was reformed and the new Chair is now Cristian Ravariu. More importantly, several



EDS Region 8 Chapter Meeting—KTH Royal Institute of Technology Stockholm, Sweden

international conferences in Region 8, with local Chapters as major organizers have been important providing initiatives in the promotion of memberships. Several research collaborations, funded through the European Community, have been established where the Chapters' members have been directly involved. Several mini-colloquia and short courses are planned towards the end of the year.

The meeting was then followed by individual chapter chair reports from: ED Sweden (Mikael Ostling), ED/AP/MTT/PHO United Kingdom & Republic of Ireland (Ali Rezazadeh), ED/MTT Moscow (Vadim Kaloshin), ED/IM/SSC Republic of Macedonia (Goce Arsov), AP/ED/MTT/COM/EMC Tomsk Russia Siberia Section (Olesya Kozhemyak), ED Israel (Gady Golan), ED Poland (Zygmunt Ciota), AP/ED/MTT/CPMT/NPS Saratov (Alexandr Sadovnikov) and ED Spain (Benjamin Iñiguez).

Following the presentations, an open forum was conducted to discuss and reflect the activities of the Chapters for further development and enhancement. Significant points from the discussion include: (1) Effectively monitoring the status of EDS chapters, including year-to-year financial reporting and proper utilization of chapter funds and resources for the benefit of members, (2) Better managing of the EDS SRC budget to support chapter visits and various chapter events in the region, (3) Ways to disseminate information regarding new EDS initiatives which are pertinent to chapters and members and (4) Liaising with the EDS HQ for coordinating the EDS biennial regional chapter meetings.

Observations from the above forum were discussed with the Vice President of Regions/Chapters Xing Zhou and the SRC for implementa-

tion and better recognition of active Chapters. The Chapter meeting concluded with a group photo session.

Following the Chapter Meeting the Mini-Colloquium on "*Ultimate Integration Limits*" held Monday, May 26, 2014, at KTH Kista Campus was a good opportunity for the Chapter Chairs/Representatives to learn from the state of the art electron devices technological advancements from several international speakers including: Simon Deleonibus (CEA LETI, France), Hiroshi Iwai (Tokyo Institute of Technology, Japan), Enrico Sangiorgi (University of Bologna, Italy), Lars-Åke Ragnarsson (IMEC, Belgium) and Zeynep Celik-Butler (UT Arlington, USA).

*Ali Rezazadeh
Region 8 SRC Vice-Chair
University of Manchester, UK
ali.rezazadeh@ieee.org*

EDS VLSI TECHNOLOGY AND CIRCUITS TECHNICAL COMMITTEE REPORT

The VLSI Technology and Circuits Technical Committee was formed in 1998 under the leadership of Professor Charles G. Sodini (MIT) and followed by Dr. H.-S. Philip Wong (IBM), Werner Weber (Infineon), Dr. James A. Hutchby (SRC) and Dr. Bin Zhao (Freescale Semiconductor). Since its formation, the VLSI Committee has made it their mission to identify new technical trends, help foster new technical concepts, and serve the emerging needs of the Electron Devices and Solid-State Circuits communities in VLSI. The committee members include many well recognized technical experts representing a very wide spectrum of technical expertise in VLSI devices, technology, and circuits. Every year the committee brainstorms (by email), ideas that are suitable for new workshops, special issues for a journals, panel sessions, and



Committee meeting attendees (left to right), Hitoshi Wakabayashi, Masaaki Niwa, Hiroshi Iwai, Reza Arghavani, Simon Deleonibus, Shuji Ikeda, Huiling Shang and Steve Chung

special sessions for conferences. Committee members then drive these ideas forward and find a way to make them happen; either by being the organizers themselves, or by finding suitable organizers for the topic. They work closely together with journal editors and conference organizers. It is much easier to attach new workshops to existing conferences, than to establish new conferences.

Objective:

The objective of the *VLSI Technology and Circuits Committee* is to identify new/hot areas of interest to the Electron Devices and Solid-State Circuits communities. Based on the nature of the areas, we will recommend any or all of the following:

1. Initiate topical workshops of current interest (attached to existing conferences or incorporated into new ones)

2. Special issues for major publications (e.g., T-ED)
3. Panel session topics for major conferences
4. Special sessions for major conferences

On Monday June 9, 2014, the VLSI Technology and Circuits Committee met in Honolulu, Hawaii, during the 2014 Symposium on VLSI Technology and Circuits, June 9–13. This committee has annual face to face meetings twice a year during the IEDM and VLSI Symposium.

The goals and deliverables of the following three subcommittees were discussed:

1. Publication Chair: Steve Chung
 - a. Propose special issues for major publications
 - b. Recommend topics, authors for publications
 - c. Recommend proposals to enhance EDS activity
2. Conferences/Workshops Chair: Kaz Ishimaru
 - a. Contact conference/workshop organizers or members and offer assistance in organizing the conferences. Propose topics, invited talks, panel sessions, and special sessions if needed.
 - b. Recommend proposals to enhance EDS activity

3. Publicity Chair: Seiichiro Kawamura
 - a. Assist organizing conferences/workshops and other activities for EDS
 - b. Recommend proposals to enhance EDS activity

Please contact Dr. Kaz Ishimaru (kazu.ishimaru@toshiba.co.jp), conferences/workshops subcommittee chair or Dr. Shu Ikeda (shu.ikeda@tei-solutions.com), committee chair for further information.

Reza Arghavani

*EDS VLSITC Committee Member
Lam Research Corporation
Fremont, CA, USA*

EDS MEMBERSHIP FEE SUBSIDY PROGRAM (MFSP)

APPLICATIONS NOW BEING ACCEPTED FOR 2015



*Mikael Östling
EDS Vice-President
of Membership &
Services*

Our society continually works to increase the value of EDS membership and our colleagues enjoy an incredible array of free and deeply-discounted, members-only benefits. One EDS initiative to encourage newcomers and assist current members is the **EDS Membership Fee Subsidy Program (MFSP)**. This program offers the generous incentive of one year complimentary IEEE and EDS memberships to help launch new chapters or enable present ones, in low income geographical areas, to grow their memberships.

This special offer is available to students and to those professionals who meet the eligibility requirements.

To complement our Society program, we are encouraging members in eligible countries to try IEEE e-Membership (an electronic membership option with reduced fees). Please visit the IEEE website for more details on e-Membership: http://www.ieee.org/membership_services/membership/join/emember.html.

The EDS Membership Fee Subsidy Program policy is as follows:

- EDS will cover the cost of a full year of IEEE and EDS membership for up to 15 new or current members per chapter, provided the existing members have not received MFSP benefits in the past.
- **Five** of the fifteen members each year must be new IEEE/EDS members.
- New and renewing members must apply through their local

chapter. Current elected officials of eligible EDS chapters will receive instructions from the EDS Executive Office.

- Chapter Chairs must verify member's eligibility according to IEEE income guidelines.

Please visit the EDS website for more information on the EDS Membership Fee Subsidy Program: <http://eds.ieee.org/mfsp.html>.

Any questions on this program should be directed to Joyce Lombardini (j.lombardini@ieee.org), EDS Membership Administrator.

Mikael Östling

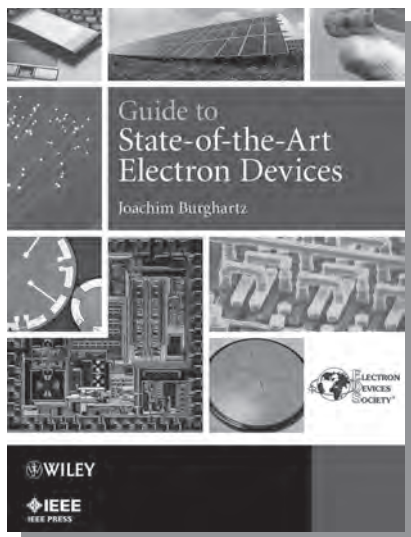
*EDS Vice-President of Membership
& Services*

*KTH Royal Institute of Technology
Stockholm, Sweden*

EDS GUIDE TO STATE-OF-THE-ART ELECTRON DEVICES

The EDS Guide to State-of-the-Art Electron Devices celebrates over 60 years of the Electron Devices Society's work, from its inception in 1952 as the IRE Professional Group on Electron Devices to its official formation as an IEEE society in 1976.

This comprehensive, full-color publication was edited by EDS Vice-President of Technical Activities, Joachim Burghartz. In addition to the foreword by Nobel Laureate and EDS Celebrated Member George E. Smith, the book contains 21 chapters by 70 contributors. A historical timeline



runs throughout the book, highlighting three key time periods/eras in the electron device field.

This publication has won the PROSE award (American Publishers Awards for professional and scholarly excellence) for the 2013 engineering and technology sub-category!

Order your copy from the IEEE store now!

IEEE members can purchase the *EDS Guide to State-of-the-Art Electron Devices* for just US\$35, which includes shipping and handling fees. This is more than 25% off the retail price.

CONGRATULATIONS TO THE 16 EDS MEMBERS RECENTLY ELECTED TO IEEE SENIOR MEMBER GRADE!

Manuel C. Blanco
Michelly De Souza
Oliver Haeberlen
Debdeep Jena
Mao Ke
Chih-Huang Lai

Jian Li
Nurul Md Yunus
P Susthitha Menon
Deepak Chandra Sekar
Osamu Shimizu
Ritu Sodhi

Jun Suda
Huili Xing
James Yakura
Jer-Liang Yeh



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

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

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

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

IEEE ELECTRON DEVICES MISSION FUND OF THE IEEE FOUNDATION

The Electron Devices Society (EDS) is proud to announce that we partnered with the IEEE Foundation to establish the **IEEE Electron Devices Mission Fund of the IEEE Foundation**.

A new endeavor for the society, this fund will be used to greatly enhance the humanitarian, educational, and research initiatives of EDS by providing members and other constituents of the EDS community with the ability to contribute directly to our mission-driven imperatives, such as the EDS-ETC Program and the EDS Student Fellowship Program. With the establishment of this fund, you too can play a direct role in this vital work.



How to Donate

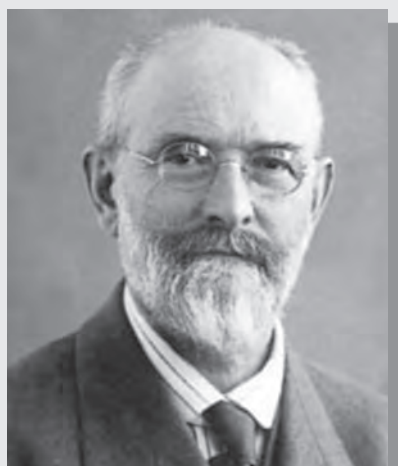
Donating is simple. Visit the IEEE Foundation online giving page at <https://www.ieeefoundation.org/Donate>,

choose your donation amount, and select "The IEEE Electron Devices Mission Fund" in the designation pull down menu. If you prefer to write a check, please make it payable to the IEEE EDS Mission Fund of the IEEE Foundation and mail it to the IEEE Foundation, 445 Hoes Lane, Piscataway, NJ, 08854, USA. That's all you need to do.

One hundred percent of your donation will be used exclusively for the humanitarian, educational, and research initiatives of EDS. If you would like to explore other ways to support the EDS Mission Fund of the IEEE Foundation, contact the IEEE Foundation at donate@ieee.org.



IEEE ROBERT BOSCH MICRO AND NANO ELECTRO MECHANICAL SYSTEMS AWARD



*Robert Bosch (1861–1942)
Inventor, Entrepreneur, Founder of
Robert Bosch GmbH*

The Robert Bosch Micro and Nano Electro Mechanical Systems Award was established by the IEEE Electron Devices Society in 2014 to recognize and honor advances in the invention, design, and/or fabrication of micro- or nano-electromechanical systems and/or devices. The contributions to be honored by this award should be innovative and useful for practical applications.

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

The recipient will receive a US\$10,000 honorarium (which includes up to \$3,000 of travel expenses for international travel and \$1,500 of travel expenses for domestic travel), a bronze medal, and a certificate. In the event that more than one awardee is selected, the cash honorarium will be equally divided among the recipients. Each recipient will receive a bronze medal and a certificate.

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

2014 AWARD WINNERS

EDS MEMBER AND IEEE LIFE FELLOW NAMED RECIPIENT OF 2014 IEEE MEDAL OF HONOR



B. Jayant Baliga of North Carolina State University has been named the recipient of the IEEE Medal of Honor.

"For the invention, implementation, and commercialization of power semiconductor devices with widespread benefits to society."

B. Jayant Baliga is considered the world's preeminent power semiconductor scientist. His development of the insulated gate bipolar transistor (IGBT) transformed the way we utilize power and has improved the comfort, convenience, and health of billions of people around the world while reducing environmental impact. Dr. Baliga's invention of the IGBT in 1979 and subsequent development and commercialization while with General Electric led to the world's most important semiconductor switch. Dr. Baliga combined the physics of bipolar and metal-oxide semiconductor field-effect transistor (MOSFET) technologies to create a device far superior to both, resulting in lighter and more efficient power converters. His leadership and perseverance in convincing General Electric to continue investing in IGBT development and his ability to address and overcome design and

technology challenges were critical to the IGBT's successful commercialization. IGBTs enabled the creation of cost-effective and efficient automobile electronic ignition systems that have reduced gasoline consumption by an estimated 1.1 trillion gallons, resulting in reduction of carbon dioxide emissions by 22 trillion pounds. The IGBT also made possible the adjustable speed motor drives for refrigeration and air conditioning and the miniature electronic ballast in energy-saving compact fluorescent bulbs. The improved efficiency of these devices due to IGBTs has resulted in a reduction in energy usage of over 50,000 terawatt hours and 56 trillion pounds in carbon dioxide emissions. IGBTs are also an essential component of compact and lightweight portable defibrillators used to control the shock delivered to victims of cardiac arrest and save the lives of hundreds of thousands of people each year. All commercially available electric and hybrid vehicles use IGBTs to control the transfer of power from the battery to the electric motors. IGBTs are also important in wind- and solar-power generation stations, converting electricity to power suitable for consumer and industrial use.

Dr. Baliga's pioneering contributions include the "Baliga Figure of Merit" for evaluating the pros and cons of materials and devices

operating in high-frequency circuits. He was able to demonstrate that wide bandgap semiconductors such as silicon carbide (SiC) and gallium nitride (GaN) could provide significant performance improvements over silicon for power electronics. His SiC power device innovations have been commercialized since 2005 by numerous companies for use in solar inverters and motor control applications. Dr. Baliga is also responsible for four successful spin-off companies from his research at North Carolina State University. Inventions that have been commercialized by these companies include the TMBS rectifier used as bypass diodes for solar panels, the super-linear RF silicon power MOSFETs used in cell-phone base station amplifiers, and MOSFETs used to deliver power to microprocessors and graphics chips in laptops and servers.

An IEEE Life Fellow, Dr. Baliga received the 2010 National Medal of Technology and Innovation from President Barack Obama, the highest honor conferred by the U.S. Government to an engineer. Dr. Baliga is currently a Distinguished University Professor at North Carolina State University, Raleigh.

Paul Yu

*EDS Vice-President of Awards
University of California, San Diego
San Diego, CA, USA*

EDS SECRETARY AND IEEE FELLOW, FERNANDO GUARIN WINS 2014 IEEE MERITORIOUS ACHIEVEMENT AWARD IN INFORMAL EDUCATION



Fernando Guarin

The IEEE Educational Activities Board (EAB) recognizes and honors individuals and companies for major contributions to engineering and technical education. The 2014 IEEE Meritorious Achievement Award in Informal Education has been won by **Fernando Guarin** for dedication to bringing the excitement of electronics engineering to high school students.

This Award in Informal Education recognizes IEEE members who volunteer in informal education settings for the benefit of teachers, students, parents of students, and the public. These volunteers will have served in advisory, educational, or fiduciary positions and used their professional background to enhance

understanding and involvement in fields of interest of IEEE by users of the informal education system. Various EAB awards are given to individuals working in engineering education, professional development, and accreditation activities.¹

Fernando is the master mind and the key person to initiate and successfully spread the EDS-ETC program through several EDS Chapters and institutions around the globe. He will receive the award at the EAB Awards Ceremony, November 22, 2014, at The Heldrich Hotel and Convention Center, New Brunswick, New Jersey.

Fernando Guarin is a Senior Engineer/Scientist at the IBM Microelectronics Semiconductor Research Development Center SRDC in East Fishkill, New York and an Adjunct Lecturer at SUNY New Paltz. He received his BSEE from the "Pontificia Universidad Javeriana," in Bogotá,

Colombia, the M.S.E.E. degree from the University of Arizona, and the Ph.D. in Electrical Engineering from Columbia University, New York. He has been actively working in microelectronic reliability for over 30 years.

From 1980 until 1988 he was a member of the Military and Aerospace Operations division of National Semiconductor Corporation. In 1988 he joined the IBM microelectronics division where he has worked in the reliability physics and modeling of Advanced Bipolar, CMOS and Silicon Germanium BiCMOS technologies. He is currently leading IBM's 14nm technology qualification. Dr. Guarin is an IEEE Fellow, Distinguished Lecturer for the IEEE Electron Devices Society, a member of the IEEE's EDS Board of Governors and Education Committees.

¹http://www.ieee.org/education_careers/education/awards/calls_for_nominations.html

EDS MEMBER AND IEEE FELLOW HONORED WITH BOAS MEDAL OF THE AUSTRALIAN INSTITUTE OF PHYSICS



Chennupati Jagadish has been recognized with the Australian Institute of Physics Boas Medal for excellence in research in physics.

The Boas Medal citation reads:
"For contributions to the fields of compound semiconductor optoelectronics, and nanotechnology. His seminal research work, in areas such as, innovative materials growth, exploitation of new physics in these new materials, novel semiconductor processing to the fabrication of state-of-the-art optoelectronic devices is truly world-leading, as demonstrated by his outstanding publication

record in highly prestigious international journals."

Jagadish received the B.Sc. degree from Nagarjuna University, Guntur, India in 1977, and the M.Sc (Tech) degree from Andhra University, Waltair, India in 1980 and the M.Phil. and Ph.D. degrees from the University of Delhi, India in 1982 and 1986, respectively. He was a Lecturer in Physics and Electronics at S.V. College, University of Delhi, during 1985–88 and worked at Queen's University, Kingston, Canada, during 1988–90 as a post-doctoral research fellow. He moved to Australia in 1990 and established a major research program in the field of optoelectronics and nanotechnology. He is currently an Australian Laureate

Fellow, Distinguished Professor and Head of Semiconductor Optoelectronics and Nanotechnology Group in the Department of Electronic Materials Engineering, Research School of Physical Sciences and Engineering, the Australian National University. He is also serving as Director of Australian National Fabrication Facility, ACT node and Convenor of the Australian Nanotechnology Network. He holds honorary positions at University of Electronic Science and Technology of China, Chengdu, University of Tokyo, Anna University and Nanjing University. He is serving as Vice-President and Secretary Physical Sciences of the Australian Academy of Science and Vice-President (Finance and Administration) of the IEEE Photonics

Society. His research interests include compound semiconductor optoelectronics and nanotechnology.

He has published more than 780 research papers (520 journal papers), 5 US patents assigned, co-authored a book, co-edited 4 books, guest edited

10 special issues of journals and edited 12 conference proceedings.

He is an IEEE Fellow, served as IEEE EDS Distinguished Lecturer (1997–2007), EDS Board of Governors member (1999–2004), Chaired EDS Optoelectronic Devices Technical

Committee (1998–2003); currently he is chairing the EDS Photovoltaic Devices Technical Committee, Steering Committee of the *IEEE Journal of Photovoltaics* and an Editor of the *IEEE Electron Device Letters*.

ANNOUNCEMENT OF THE 2014 EDS PhD STUDENT FELLOWSHIP WINNERS



Agis Iliadis
EDS Student
Fellowship Chair

The Electron Devices Society PhD Student Fellowship Program was designed 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.

EDS proudly announces three EDS PhD Student Fellowship winners for 2014. Brief biographies of the recipients appear below. Detailed articles about each PhD Student Fellowship winner and their work will appear in forthcoming issues of the EDS Newsletter.



Peng Huang is pursuing a PhD degree on the modeling and simulation of metal oxide based-RRAM at Peking University. Over the course of his research work,

he has set the following milestones and accomplishments in the domain of RRAM: (i) developing a physics-based analytic model for RRAM to describe its set, reset, and conduction processes, firstly implementing in HSPICE simulation of RRAM-based circuit such as RRAM array and Neuromorphic computation; (ii) firstly developing a compact model of RRAM endurance degradation behavior, which enables the design of periphery circuit to improve the RRAM endurance on the circuit level. His most recent work includes the parameter extraction on RRAM and structure optimization in TaOx-RRAM. His paper citation has increased to more than 80 times.



Amit Trivedi

Since the 2010 Fall Semester, Amit has been pursuing his doctoral studies at Georgia Institute of Technology under Dr. Saibal Mukhopadhyay. Amit is exploring applications of emerging technologies in neuromorphic computing by exploiting their unique and rich characteristics. An ultra-low power neuromorphic computing platform based on emerging technologies can solve complex problems such as recognition in ubiquitously and remotely deployed electronics. Amit was a staff research engineer at IBM Semiconductor Research and Development Center, India, from 2008–10. During the summers of

2012 and 2014, he was a research internship student at IBM T. J. Watson Center and at Intel Circuits Research Lab, respectively.



Sam Vaziri is currently a PhD candidate in the department of Integrated Devices and Circuits, at ICT School, KTH Royal Institute of Technology, Stockholm, Sweden. He received his Master of Science in Nanotechnology from KTH in 2011. Previously, he received a Master of Science in Solid State Physics from K.N.Toosi University of Technology, in Tehran, Iran. From the master program at KTH to date, his research activities and interests encompass graphene integration technology, novel graphene base hot electron transistors, graphene photodetectors and modulators, graphene-based electromechanical pressure sensors, and graphene inkjet printing. He has published eleven articles in peer reviewed prestigious journals like *IEEE Transactions on Electron Devices*, *Nano Letters*, and *Advanced Materials*. He has authored and contributed to more than 10 conference contributions including oral presentations at DRC, ESSDERC and EMRS. His publications have received over 100 citations so far.

Agis Iliadis
EDS Student Fellowship Chair
University of Maryland
College Park, MD, USA

ANNOUNCEMENT OF THE 2014 EDS MASTERS STUDENT FELLOWSHIP WINNERS

The Electron Devices Society Masters Student Fellowship Program was designed to promote, recognize, and support Masters 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.

EDS proudly announces two winners of the 2014 EDS Masters Student Fellowship. Brief biographies of the recipients appear below. Detailed articles about each Masters

Student Fellowship winner and their work will appear in forthcoming issues of the EDS Newsletter.



Yexin Deng received the B.S. degree from Peking University, Beijing, China, in 2013. He is currently working toward the PhD degree with the School of Electrical and Computer Engineering, Purdue University, West Lafayette, Indiana, USA. From 2011 to 2013, he worked with colleagues from Stanford University on designing and simulation of 2D and 3D RRAM array architectures. Now he is working on 2D semiconductor electronic and optoelectronic devices. He has authored and co-authored tens of papers appearing in the *IEEE International Electron Devices Meeting (IEDM)*, *Symposia of VLSI Technology (VLSI-T)*, *IEEE Electron Device Letters*, *IEEE*

Transactions on Electron Devices, *ACS Nano*, and *Nanotechnology*.



Sik Lam Siu received his BEng degree in electronic engineering from City University of Hong Kong in 2008. Currently, he is a Mphil student in The University of Hong Kong, his research field is Magnetic field sensing MOS-FET. He has been working with micro-electronic circuit design since 2008. His research interests include nano-device characterization, radio-frequency circuit design, power-management circuit design, and development of integrated sensing system.

Agis Iliadis
EDS PhD & Masters Student
Fellowship Chair
University of Maryland
College Park, MD, USA



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IEEE ELECTRON DEVICES SOCIETY AND RELIABILITY SOCIETY

CALL FOR NOMINATIONS: EDITOR-IN-CHIEF IEEE TRANSACTIONS ON DEVICE AND MATERIALS RELIABILITY

The IEEE Electron Devices Society (EDS) and Reliability Society (RS) invite nominations for the position of Editor-in-Chief for the IEEE Transactions on Device and Materials Reliability (T-DMR) for a 3-year term beginning in 2015.

T-DMR was launched in 2001 to provide leading-edge information critical to the creation of reliable electronic devices and materials. With a focus on interdisciplinary communication, the journal covers the reliability of electronic, optical, and magnetic devices, and microsystems; the materials and processes used in the manufacture of these devices; and the interfaces and surfaces of these materials.

The nominee should be a member of EDS or RS. He/she must have served in an editorial capacity for an archival journal. Desirable qualifications include: solid technical accomplishments, leadership, integrity and ethical standards, organizational and management skills, and a vision for moving the journal forward. The EiC's duties include appointing Editors to serve across the scope of the journal; supervising the operations of the journal through ScholarOne Manuscripts with the assistance of the T-DMR publications staff; monitoring the quality and timeliness of publications; and leading developments to strengthen the journal.

Please submit nominations to: Jo Ann Marsh via email to j.marsh@ieee.org by **November 15, 2014**

Nominations should include:

- 1) Name of candidate and nominator;
- 2) A brief biography (1 page), including a listing of the candidate's editorial experience;
- 3) A brief supporting statement from the nominator(s); and
- 4) Optionally, a statement up to 500 words on nominee's vision for T-DMR.

*Bin Zhao
VP of Publications
IEEE Electron Devices Society*

*Phillip A. Laplante
VP of Publications
IEEE Reliability Society*

YOUNG PROFESSIONALS

MEETING EDS YOUNG PROFESSIONALS

Young Professionals are an important and dynamic part of the Electron Devices Society (EDS). Not only do they represent the future of the society, but in many cases they are its present.



Dr. Kyle Montgomery is a Young Professional who actively collaborates with EDS. He is a researcher and lecturer in the area of compound

semiconductor photovoltaics at the University of California, Davis. His experience as an active member of the society is something to which we hope many other Young Professionals can look forward and, eventually, relate to. He will describe for us how EDS has helped him navigate the earlier stages of his career and formed him as an engineer and scientist.

Q: Kyle, can you please tell us a little about yourself, your background, your career, and your current line of work?

A: Sure thing...I grew up in the big city of Houston, Texas, where I did my undergraduate studies at the University of Houston (BS, 2004). Back in those days, I was still deciding whether to focus on being an engineer or a touring musician/rock star. Obviously, I decided to focus on the former, but I still keep things lively by playing the drums or strumming a ukulele from time to time! After my undergrad, I went to work at Schlumberger, a leading global oilfield service company, where I was tasked with building environmental test systems for passive component characterization. We would conduct electrical endurance tests under a variety of conditions experienced in downhole drilling



including high temperatures, thermal cycling, shock, and vibration. After a few years at Schlumberger, I decided to set aside the steady paycheck for a while and re-enter life as a student, by attending graduate school at Purdue University (MS, 2008; PhD, 2012). During my first semester at Purdue I was introduced to Jerry Woodall, an IEEE Fellow and longtime EDS member, who taught me just about everything I know about compound semiconductor materials and devices. He served as my thesis advisor and has been a great friend and mentor to me for the past seven years. For my PhD, I narrowed in on the area of wide bandgap semiconductors for photovoltaics. These materials have interesting application for high efficiency multijunction solar cells, as well as solar cells used in high temperature environments, such as space missions sending satellites to Mercury or the sun. After graduating, I came to UC Davis to continue research in the area of photovoltaics, but I also support new projects in novel heterojunction bipolar transistors and hybrid solar energy systems. In addition, beginning this year, I work part-time as a lecturer in the Department of Electrical & Computer Engineering.

Q: That sounds like quite a journey, so after all that, how did you become involved in EDS, and what is your current connection with the society?

A: My initial connection to EDS came through my involvement as a graduate student with the IEEE Photovoltaic Specialists Conference (PVSC), which EDS sponsors. I have had the

privilege of serving on the planning committee of the PVSC for the past several years, and, through this, was able to make great connections with several longtime EDS members who got me plugged in to more of what EDS is doing. Since then, I have assisted in different areas, such as helping to establish the EDS Student Mixer at the PVSC, which typically brings in about 150-200 student attendees each year. In addition, I am on the Young Professionals Committee of EDS (since 2013).

Q: So it looks like EDS has been in the center of your professional life. What has the society brought to your career? How has it contributed in shaping it to where it is now?

A: Well, to start, EDS is really the top professional society, in my opinion, for my area of research. They sponsor some of the top journals in the field, including the relatively new *IEEE Journal of Photovoltaics*. And, as mentioned prior, they sponsor key technical conferences such as the PVSC. In this sense, EDS was already shaping my career before I even knew it. However, since becoming a member, I have enjoyed other benefits such as networking with other professionals in EDS, excellent webinars on both technical and non-technical subjects of relevance to my work, and access to scholarships and awards available only to EDS members.

Q: In your opinion, why should a young engineer, like a recent college graduate, join EDS?

A: To me, there are a couple of primary reasons. First, being a member

of a technical society, in general, is important for career development. Not only are there great networking opportunities, but being an EDS member is something that will stay with you regardless of where you work. The fact is that many of us will move around quite a bit during our career, so having a solid grounding through a like-minded technical society is a great way to stay connected. Second, EDS members get free

online access to the EDS journals, which is a great way to stay up-to-date on new research in your area of interest.

Q: Kyle, thank you for your time. Any last remarks for other Young Professionals?

A: I will simply say that if are not already an EDS member...join now! If you are a member, then I encourage you to plug in and get connected with

your local chapter. I guarantee you that many connections you make through EDS will last a lifetime. Cheers!

Contact Kyle at kmontgomery@ucdavis.edu, or find him online at www.kmontgomery.net.

*Daniel Camacho
EDS BoG Member & YP Chair
Intel Corporation
Folsom, CA, USA*

EDS-ETC

Engineers Demonstrating Science:
an Engineer Teacher Connection

HILLSBOROUGH HIGH SCHOOL iSTEM CLUB

The Hillsborough High School iSTEM club was established this year to help students better understand possible career choices in Science, Technology, Engineering, and Math. Several of the students in the club were considering an engineering or related technical career path and wanted to better understand the various engineering disciplines.

Students did research on what different types of engineers actually did on a day to day basis and presented to the club their findings. This included the fields of electrical, mechanical, civil, biomedical as well as the less applied science and math aspects of STEM. Students also drew upon experiences of faculty members who worked as scientists or engineers prior to teaching.

Support provided by the Princeton branch of the IEEE (Institute of Electrical and Electronic Engineers) enabled students to investigate beginning electronic projects using Snap Circuits® kits. Students built several functioning circuits (including AM and FM radio, signal generators, and LED timers). After working

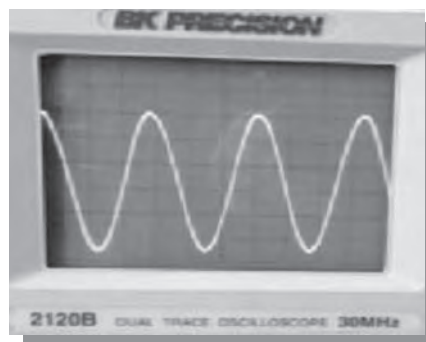


Fig. 1 (Incoming AC signal)



Fig. 2 (rectified AC signal)



Fig. 3 (Hillsborough High School students presenting their poster at the 2014 ISEC conference)

with the circuits, the students began to question how the components worked and focused initially on the diode. One of the projects allowed students to discover how diodes functioned as an electrical one way valve. The club members then took this further as students set up a circuit using kit components to see how a diode affected an AC signal.

The students took a (1400 Hz) sine wave from a waveform generator and first displayed it on an oscilloscope

to establish a baseline. They then applied that signal across the diode and measured the resulting signal across a resistor in series with the diode. By doing this, students learned in a hands-on manner, how a diode rectified an incoming AC signal. These oscilloscope images are shown in the Fig 1 and Fig 2. Club members summarized their findings and presented a poster paper at the 2014 ISEC (Integrated Stem Education Conference) in Princeton as shown in Fig 3. Students

were supported by J. Silver and Dr. S. Naganathan who served as advisors for the club.

Future plans for the STEM club include exploring digital logic and coding using Arduino boards, continuation of components studies, and bringing in outside speakers. The club serves as a student-centered and hands-on supplement to the standard science and math curriculum and provides a way to involve and motivate high school students interested in STEM.

NEW EDITIONS TO THE EDS WEBINAR ARCHIVE

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.

Launched in 2011, the EDS webinar series delivers live, interactive lectures right to your desktop with luminaries from the device engineering field. And, if you can't attend in person, you can always watch replays on the EDS site 24/7.

Recent Events:



Rakesh Kumar



Xiuling Li

- **Innovation and Entrepreneurship Opportunities in the IC world**
Presented by: Rakesh Kumar, President & CEO, TCX Technology Connexions
- **Planar Nanowire-based Transistors and Vertical Nanowire-based Solar Cells: Performance and Manufacturability**

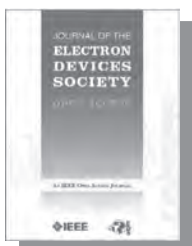
Presented by: Xiuling Li, University of Illinois

- **Packaging Challenges in a World Driven by the Internet of Things and Migration to the Cloud**

Presented by: W. R. Bottoms

- **Terrestrial Radiation Induced Soft Errors in Integrated Circuits**
Presented by: Stewart Rauch
- **New Requirements to be Proposed for the CEC's Eligible Solar Electric Equipment Guidelines**
Presented by: Patrick Saxton, John Wohlgemuth and Ralph Romero.

IEEE JOURNAL OF THE ELECTRON DEVICES SOCIETY (J-EDS)



A new issue of the fully electronic *IEEE Journal of the Electron Devices Society* (J-EDS) has now been released. As an OPEN ACCESS publication, it is accessible free of charge to all readers in the global technical community on the IEEE Xplore® Digital Library.

Please download and enjoy the many technical contributions published in J-EDS.

Also, the authors will be willing to entertain technical questions on these papers via the EDS QuestEDS portal: <http://eds.ieee.org/questeds.html>.

EDS encourages you to submit a manuscript for publication in this fast-growing journal. The editorial board is committed to serving its customers.

For detailed information on manuscript submission, please visit the J-EDS section of the EDS site.

Thank you very much and we look forward to receiving your manuscripts for publication in J-EDS.

Renuka P. Jindal
J-EDS Editor-In-Chief
r.jindal@ieee.org

QUESTEDS



Samar Saha
EDS President-Elect

Interested in knowing why it's not possible to measure the built-in voltage of a PN junction using a voltmeter? Do you need to understand the best way to derive an expression for the average thermal velocity of an electron? Or are you curious about what quantum dots and wires are? The answers to these questions and more are available through the QuestEDS Question and Answer page.

To ask a question not already addressed on the Q&A page, visit www.ieee.org/go/questeds. Technical experts answering the questions posed represent academic, government, and industry sectors.

Questions are grouped into nine technical categories and two general ones. Technical categories cover subject areas like semiconductor and device physics, process technology, device characterization, technology CAD, compact modeling, VLSI interconnects, photovoltaics, and quantum electronics. Subject areas addressed are anticipated to expand in the future. Two other categories address questions pertaining to educational activities and general inquiries about society membership. Within a two week time frame from when the question is asked, an answer is posted online. Incoming

Educational Activities

Question 037-09:

I am planning on doing my Ph.D. in design aspects of VLSI circuits and chips. Can you guide me how do I start and which topics will be relevant to start my work?

Answer 037-09:

In VLSI design, there are a variety of scopes to pursue research for a Ph.D. degree. In order to undertake such a project, one has to look into the challenges to continuous scaling of CMOS device and technology [1]. Some of the potential projects are identified below:

As the technology solution to overcome the challenges in device scaling has become too expensive, innovative VLSI design has become crucial. In this context, one of the challenges of advanced VLSI design is the process variability and innovative design techniques are crucial to mitigate the risk of variability in circuit performance. Secondly, with the increasing demands and usage of mobile computing, analog/radio-frequency (RF) VLSI and system-on-chips (SoC) circuits including low noise circuit design are important projects to work on. Another area to undertake a Ph.D. project is the power management in VLSI circuits. With the continued scaling of device geometry, more and more components are integrated in the same area of the chip. As a result, the power dissipation has become a serious issue. Therefore, VLSI circuit design for ultra-low voltage application is an important area for a Ph.D. project. Besides the design projects, there are similar scopes in device architecture and modeling in the above referred areas to mitigate the impact of variability and power consumption and improvement of analog/RF performance in VLSI circuits.

In summary, the research areas in VLSI design include design innovation to mitigate the risk of variability in advanced technologies and analog/RF and ultra-low power circuit design. And, the best way to start a Ph.D. project is to contact the potential research institutions and experts working on similar projects.

[1] G. Declerck, "A look into the future of nanoelectronics" in 2005 Symp. on VLSI Tech. Dig. of Technical Papers, pp. 6–10.

questions are handled by an editor-in-chief who ensures that they fall within the technical scope of EDS and that they are adequately answered.

To view the entire library of questions and answers, visit <http://eds.ieee.org/member-sign-in-form>.

[html?notauth=1](#). Your IEEE login is required to view the answer page.

Samar Saha
EDS President-Elect
Ultrasolar Technology
Santa Clara, CA, USA

CHAPTER NEWS

Singapore Chapter's Art Exhibition on Devices

—by Gan Chee Lip

The IEEE Rel/CPMT/ED Singapore Chapter organized a unique event during its flagship conference IPFA (International Symposium on Physical and Failure Analysis of Integrated Circuits), which is technically co-sponsored by the IEEE Electron Devices Society. IPFA, in its 27th year of existence, held the annual conference at Marina Bay Sands Convention Centre Singapore, June 30 to July 4, 2014.

A photo contest of micrographic pictures of device failures called “*Art of Failure Analysis*,” is a major attraction during IPFA for all the participants.

This contest provides FA enthusiasts a platform to showcase their best photos and artistic traits. IPFA 2014 received 36 entries featuring pictures of device failures from all over the world. The top 10 photos were shortlisted by the organizing committee for final voting by IPFA conference attendees to determine the winner.

The best picture selection was “*Birdie in the Hole*” which shows an improper filling of a copper via resolved using a Field Emission gun SEM. Photo taken by Lew Li Lian of GLOBALFOUNDRIES, Singapore. A semiconductor device surface imaged using SEM shows a flower and is named “*Hibiscus*” which won the second place prize, and taken by

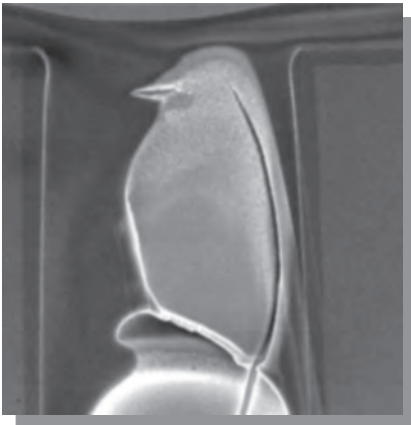
Khoo Bing Sheng of Wintech Nano Technology, Singapore. Third prize went to two images: “*Two Loving Birds on Tree Branch*,” taken by Muhamad Himli Rosnan of ON Semiconductors, depicts a SEM image of metal peeling on a bond pad. “*White Christmas*” is an image of corrosion growth on a wafer surface, taken by Cheng Khew Cheng of SSMC, Singapore. The photo copyrights belong to the IPFA conference and the Chapter.

Report on the IEEE EDS Mini-Colloquium on Nanoelectronics, Belgrade, Serbia

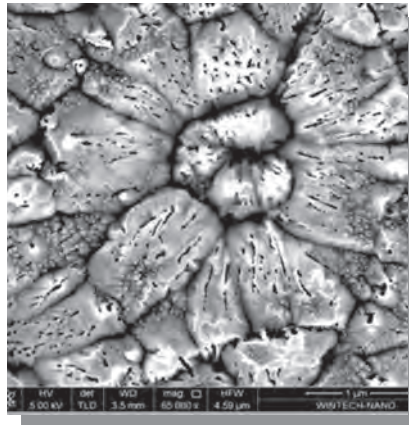
—by Ninoslav Stojadinović

An IEEE EDS sponsored Mini-Colloquium on Nanoelectronics (MQ) was held, Monday, May 12, 2014, at the Serbian Academy of Sciences and Arts, Belgrade, Serbia. This MQ was organized in conjunction with the 29th International Conference on Microelectronics—MIEL 2014, giving great opportunity to foreign participants to be updated with novelties in modern scientific field. Detailed information on the EDS MQ can be found at: http://miel.elfak.ni.ac.rs/Mini_coloquia_on.htm. The objective of the MQ was to present the topics on Nanotechnologies and Nanodevices.

The event started with a welcome and opening address by Ninoslav Stojadinović, ED/SSC Chapter Chair of the IEEE Serbia and Montenegro Section. The opening address was followed by five presentations given by leading experts in the field, including these IEEE EDS Distinguished Lectures: “*2-D Nanocrystals for Next-Generation Green Electronics*” (Kaustav Banerjee, University of California at Santa Barbara, USA), “*Circuit Design in Nanoscale FDSOI Technologies*” (Borivoje Nikolić, University of California at Berkeley, USA), “*On*



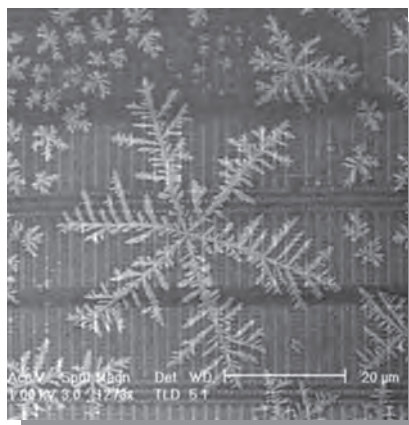
Birdie in the Hole



Hibiscus



Two Loving Birds on Tree Branch



White Christmas



Professor Simon Deleonibus presenting his work at MQ on Nanoelectronics



Professor Shunri Oda at MQ talk

the way to Heterogeneous Nano-electronics, Towards the Zero Power and Zero Variability World" (Simon Deleonibus, CEA/LETI, Grenoble, France), "Silicon Quantum Dot Devices for Future Electronics" (Shunri Oda, Tokyo Institute of Technology, Japan), and "Development of Fast Neutral Etching for Integrated Circuits and Nanotechnologies Fast Neutrals in Gas" (Zoran Petrović, Institute of Physics, Belgrade, Serbia). The event included a coffee break, lunch and welcome cocktail.

The MQ was very well received by the audience of about 60 people, in terms of organization, technical quality of the contributions and opportunities for discussion. All presentations were interactive with lively participation by the attendees. The attendance was mainly MIEL 2014 Conference participants and local students and professors.

Report on the IEEE EDS Mini-Colloquium on Nanometer CMOS Technology, Beijing, China

The 40th Workshop & IEEE EDS Mini-Colloquium (MQ) on Nanometer CMOS Technology (WIMNACT-40), was jointly organized by the ED Peking University (PKU) Student Chapter, the ED Tsinghua University (THU) Student Chapter, and ED University of Chinese Academy of Sciences (CAS) Student Chapter, and successfully held, April 10, 2014. This event was hosted by the Peking University Student Chapter and held at the Peking University campus, in the newly constructed Institute of Microelectronics building. This MQ was supported by the following EDS Distinguished Lecturers: Prof. Xing Zhou of Nanyang Technological University, Prof. Steve S. Chung of National Chiao Tung University, Prof. Tian-ling Ren of THU, Prof. Ming Liu of CAS, and Prof. Ru Huang of PKU. This joint event was attended by about 100 students and professors from PKU, THU and CAS.

Prof. Ru Huang gave the welcome address and the program commenced with the following lectures, covering a broad range of topics on the current research interests:

- Xing Zhou, "Compacting Models: The Art of Compact Modeling"
- Steve S. Chung, "The Random Trap Fluctuation and Its Impact on the Trigate Devices"
- Tian-ling Ren, "High Frequency Nanoscale Surface Acoustic Wave Biosensor"
- Ming Liu, "Organic Electronic Device and Circuit"
- Ru Huang, "Steep-Slope Devices with Mechanism Engineering for Future Ultralow Power Applications"

The lectures produced many interactions and discussions among the speakers and their audiences.

After the technical talks, Prof. Zhou, EDS Vice President of Regions/Chapters, gave a brief introduction and discussed the strategies of the Society, regional activities, chapter incentives and promotion opportunities offered by the EDS.

In the afternoon session, the three local student chapters held a short meeting with EDS officers, Prof. Zhou (EDS Vice President Regions/Chapters), Prof. Chung (Chair ED SRC Region 10), and Prof. Huang (Vice-Chair EDS SRC Region 10). The student chapter chairs, Ms. Xiaobo Jiang (ED PKU), Mr. Luqi Tao (ED THU), and Mr. Wei Wang (ED CAS), shared their respective student chapters' activities



First row, starting 4th from left: Prof. Ming Liu, Prof. Ru Huang, Prof. Steve S. Chung, Prof. Xing Zhou and Prof. Tian-ling Ren, with some of the participants of the MQ

as well as planned events for 2014. The main discussions were on how to invite DL lecturers and the incentives for the students to join as a new member.

Xiaobo Jiang
ED Peking University Student
Chapter

Luqi Tao
EDTsinghua University Student
Chapter

Wei Wang
ED University of Chinese Academy
of Sciences Student Chapter

EDS Mini-Colloquium held in Guangzhou, China

The ED Guangzhou Chapter hosted this year's first mini-colloquium, May 9th at China CEPREI Lab. Sixty-five academic staff and graduate students from CEPREI, Sen Yat-Sun University, South China University of Technology



Distinguished Lecturers, Prof. Edward Yi Chang (second from left), Prof. Jiann-Shiun Yuan (third from left) and some of the attendees at the ED Guangzhou Chapter, May 9, 2014

attended the MQ. Presentations and invited seminars related to GaN device and package reliability were given by four lecturers, including two Distinguished Lecturers. Highlights of the seminars were:

- "CMOS RF Circuit Reliability" presented by Prof. Jiann-Shiun Yuan from University of Central Florida, USA

- "Realization of GaN HEMTs for High Power & High Frequency Applications" by Prof. Edward Yi CHANG from University of Central Florida, USA

Kong Xuedong
ED Guangzhou Chapter Chair
China CEPREI Lab
Guangzhou, China

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REGIONAL NEWS

EUROPE, MIDDLE EAST & AFRICA (REGION 8)

ED Dublin/PHO Ireland

—by Patrick McNally

The joint chapter of the Dublin Electron Devices and the Ireland Photonics Societies hosted Professor Brian Tanner at the Rince Institute of Dublin City University on June 3, 2014. An audience of over fifty attendees heard Professor Tanner, Dean for University Enterprise and Professor of Physics at Durham University, UK, present a lecture entitled “*University Intellectual Property: What is it Worth?*” Professor Tanner addressed the spectacular rise and fall in the number of UK University start-ups over the past 20 years and discussed the merits of different models of commercialization of research, in particular how these models would apply in Ireland.

Brian Tanner has been a member of two teams that have spun-out companies based on intellectual property partly generated from his own research, both of which have floated. He is a non-executive Director of the Kromek Group PLC and holds the Queen’s Award for Enterprise Promotion. The large audience included practicing engineers and commercialization specialists, who

took part in a lively and stimulating discussion that continued for 45 minutes after the talk.

~Jonathan Terry, Editor

2014 International Conference on Microelectronics (MIEL)

—by Ninoslav Stojadinović

The 29th International Conference on Microelectronics (MIEL 2014) was held, May 12–14, 2014, at the Serbian Academy of Sciences and Arts, Belgrade, Serbia. The conference was organized by the IEEE Serbia and

Montenegro Section—ED/SSC Chapter in cooperation with the Faculty of Electronic Engineering (University of Niš) and Serbian Academy of Sciences and Arts, under co-sponsorship of the IEEE EDS in cooperation with the IEEE SSCS, and under auspices of Serbian Ministry of Education, Science, and Technological Development, Academy of Engineering Sciences of Serbia, and Serbian Society for ETRAN.

The Mini-Colloquium on Nanoelectronics (<http://miel.elfak.ni.ac.rs/>)



Conference Chairman, Professor Ninoslav Stojadinović addressing the audience at the MIEL 2014 Opening Session



Professor Brian Tanner of Durham University speaking at the Rince Institute in Dublin, Ireland



Four participants received Best Paper Awards, (from the left) Inga Zbierska (France), Enrique Miranda (Spain), Ninoslav Stojadinović (Serbia), Vladimir Milovanović (Austria), Ondzej Szabo (Slovakia)



Professor Zoran Jakšić speaking about Nanoplasmonic Chemical Sensors at MIEL 2014

Mini_coloquia_on.htm), held May 12th, attracted a lot of interest from both domestic and foreign participants. It was an excellent introduction to the main technical program of the MIEL Conference, which consisted of twelve regular sessions: Power Devices and ICs, Nanoelectronic Devices, MEMS and Sensors, Modeling and Simulation, Advanced Technologies and Devices, Device Physics and Technologies, Reliability Physics, Device Characterization, Reliability and Characterization, Circuit Design and Testing, System Design, Circuits and Systems. The attendees, 41 domestic and 69 foreign, traveled from 30 different countries. There were 10 keynote invited papers and 91 regular contributions (51 in oral sessions and 40 posters) presented. The conference proceedings (478 pages) were published through the IEEE Conference Publication Program, and will be available on *IEEE Xplore*.

The keynote invited speakers were: P. Igić (Swansea University, United Kingdom), Z. Djurić (Serbian Academy of Science and Arts, Belgrade, Serbia), S. Selberherr (Technical University of Vienna, Austria), H. Wong (City University of Hong Kong, Hong Kong), S. Dimitrijević (Griffith University, Nathan, Australia), Z. Jakšić (ICTM—CMT, Belgrade, Serbia), D. Manić (CSEM, Neuchâtel, Switzerland), X. Zhou (Nanyang Technological University, Singapore), P. Hagouel (OPTelec, Thessaloniki, Greece), R. Popović (EPFL, Lausanne, Switzerland).

Based on evaluation of the quality of the papers and presentations, three Best Paper Awards were presented to V. Milovanović (Technical University of Vienna, Austria) for an oral paper "A Two-Differential-Input / Differential-Output Fully Complementary Self-Biased Open-Loop Analog Voltage Comparator in 40 nm LP CMOS;" to O. Szabo (Slovak University of

Technology, Bratislava, Slovakia) for a poster paper "Sputtered Gold Nanostructures;" and to I. Zbierska (Université de Lyon, France) for a student paper "Investigation of Electrical Characteristics of Multi-gate Bulk nMOSFET." In addition, *Microelectronics Reliability* journal awarded the paper "Equivalent Circuit Model for the Switching Conduction Characteristics of TiO_2 -Based MIM Structures," by J. Blasco (Universitat Autònoma de Barcelona, Spain).

As is among best traditions of MIEL, the social program of this year's conference issue was particularly rich, with a conference banquet and gala dinner as highlights. Besides the high quality of presentations, MIEL conferences are generally flavored by a friendly atmosphere and great hospitality of the local people. This special charm adds to very positive impressions the participants bring from the conference, and is one of the reasons why one rarely attends MIEL just once: one who comes will almost certainly come again. So, we are very much looking forward to welcoming old and new friends at MIEL 2016.

~Zygmunt Ciota, Editor

ASIA & PACIFIC (REGION 10)

ED Beijing

On April 8, 2014, Dr. Xing Zhou from the Nanyang Technological University visited the EDS Beijing Chapter. With the



Dr. Xing Zhou (lecturer, first row, 9th from left), Prof. Tianchun Ye (first row, 10th from left) and Prof. Ming Liu (first row, 11th from left) with student members

Chapter's arrangement, he delivered an EDS Distinguished Lecture entitled "A Unified Compact Model for GaN-Based HEMTs." The lecture was held in the Institute of Microelectronics of Chinese Academy of Sciences (IMECAS) and hosted by the Chapter Vice Chair, Prof. Ming Liu from IMECAS. There were more than 50 attendees of local professionals and graduate students from the Beijing Chapter.

The topic of the lecture was on the fundamentals in compact modeling of generic FETs, reviewed in the context of the URM approach, and its extension to modeling the 2DEG in HEMT devices. HEMT-specific features were also discussed, such as source/drain access resistances, current-collapse, self-heating, and parallel-channel effects. Finally, Model comparisons with quasi-ballistic (QB)-based formalism were made, and model implementation in SPICE as well as application to high-frequency digital/analog circuit building blocks were demonstrated. The new points of his research on the unified compact model for GaN-based HEMTs made a big splash and were widely discussed.

After the lecture, congratulations were given on the establishment of the newly formed IEEE EDS Student Chapter of IMECAS and active recruitment of new members took place. The new student chapter advisor, Director of IMECAS, Tianchun Ye, made a speech, followed by Dr. Zhou, also the IEEE EDS Vice President of Regions/Chapters, spoke about the benefits of the Society and encouraged the students to join the new student chapter of IMECAS.

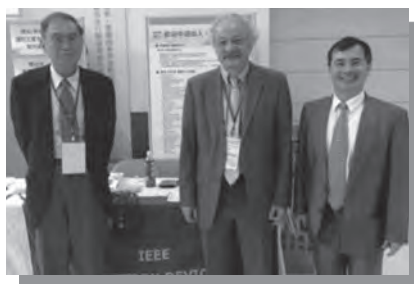
Report on the Symposium on Nano Device Technology, HsinChu, Taiwan

—by Wen-Kuan Yeh

The ED Tainan Chapter organized a Symposium on Nano Device Technology (SNDT) at Nano Device Laboratory (NDL) in HsinChu, Taiwan, May 1–2, 2014. This Symposium focused on "The New Idea and Advancement in Nano Device and Technology."



The invited speakers at the poster of SNDT 2014 (left to right), Prof. Janne Wha Wu (NCCU), Prof. Jiann-Shiun Yuan (University of Central Florida, EDS Distinguished Lecturer), Prof. Wen-Kuna Yeh (Chair of ED Tainan Chapter), Prof. Chin-Chun Meng (NCTU), Prof. Chien-Nan Kuo (NCTU), Dr. Guo-Wei Huang (NDL), and Chin-Li Lin (FCU)



(Left to right), Prof. Simon M. Sze (IEEE Fellow), Dr. Simon Deleonibus (IEEE Fellow) and, Prof. Wen-Kuna Yeh (ED Tainan Chapter Chair), at the IEEE EDS membership booth

The following two speakers were invited to give plenary speeches: Prof. Simon M. Sze (IEEE Fellow) of National Chiao-Tung University, Taiwan, with the topic "My Years at Bell Laboratories—on Bell Labs' Pioneering Contribution to Semiconductor Technology;" and Dr. Simon Deleonibus (IEEE Fellow) of CEA, LETI, France, with the topic "The Future of Micro and Nanoelectronics in the Zero Power and Zero Variability Era." In addition, twenty invited talks including EDS Distinguished Lectures were held in 6 concurrent sections. About 200 students and some professors of local universities attended the Symposium. An IEEE EDS membership booth was on site at this symposium to encourage attendees to join the Society.

ED Taipei

—by Steve Chung

The ED Taipei Chapter held many activities in the second quarter of 2014.

The first event with three invited speakers was held at the campus of National Chiao Tung University:

- Dr. Angada Sachid, University of California, Berkeley, gave a talk on April 23rd on "Fin-FETs and Layered Semiconductor MOSFETs for Future CMOS Applications." Dr. Sachid presented a novel concept in the design of FinFET and some preliminary results of the advancement of 2D electronic devices, the layered semiconductor devices for future applications. The talk was well attended by more than 60 participants, including students and professors from local universities. Afterwards, a guided tour of the NCTU semiconductor facilities was arranged for the speaker.
- Prof. Philip Wong, Stanford University, presented on "Metal Oxide Resistive Switching Random Access Memory (RRAM)—Modeling, Scaling, and 3D Integration," on May 20th. He began with a general concept of the RRAM, and then introduced the fabrication process and essential device characteristics. Dr. Wong also described their most recent efforts to explore device size scaling below 10 nm as well as 3D stacking of RRAM. His talk was attended by more than 50 students and professors.
- Prof. Khaled Salama of KAUST (King Abdullah University of



ED Taipei May 20th invited talk. (1st row from left) T. H. Hou (5th), Philip Wong (6th, speaker), Steve Chung (seminar host), with participating professors and students



ED Taipei May 30th invited talk. (1st row from left) T. H. Hou (3rd, seminar host), Khaled Salama (5th, speaker), Henry HC Kuo (6th, Taipei Photonics Chapter Chair), with participating professors and students

Science and Technology), gave a talk entitled, *"Memristor Crossbar Sneak Path Problem: Challenges and Solutions."* In addition to Prof. Salama's presentation, which addressed key issues of sneak path in a RRAM, he also shared with students some very nice EE student fellowships available for Masters and Ph.D. degree studies. For those who are interested in the KAUST scholarships, please contact Prof. Salama, Khaled.salama@kaust.edu.sa. This event attracted more than 40 students, with half of the attendees being student members of IEEE.

Many key EDS members were involved in three successful conferences held in northern Taiwan during last quarter. The 2014 IEEE VLSI-TSA, <http://vlsitsa.itri.org.tw/2014/General/>, held April 23–25, in Hsinchu; the 2014 ISNE, <http://isne2014.cgu.edu.tw/>, on May 7–10, at Chang Gung Uni-

versity, Taoyuan, and the 2014 IEEE EDS IMW (International Memory Workshop), <http://www.ewh.ieee.org/soc/eds/imw/>, held May 18–21, at the Taipei Regent Hotel. In particular, the IMW is 100% financially sponsored by the EDS and although it is the sixth IMW meeting of the series, it has a long history of Non-Volatile Semiconductor Memory Workshops (NVSMW) dating back to 1976. In 2008, NVSMW and the International Conference on Memory Technology and Design (IC-MTD) merged together to become a world premiere memory conference. The IMW is a unique forum for specialists in all aspects of nonvolatile and volatile memory microelectronics nowadays. This was the first time the IMW was held in Taiwan and did quite well with 225 registrants worldwide. There were representatives from many industries e.g., IBM, Intel, Sandisk, Micron Technology, SST, Toshiba, Hitachi, Applied Materials, etc., with

sponsorships by Macronix, ITRI, SST, and Applied Materials. Dr. Penny Du, (PennyDu@mxic.com.tw), of Macronix International Co. Ltd., Hsinchu Science Park, was the local organizer.

For those who are interested in submitting papers to the 2015 VLSI-TSA, scheduled for the end of April 2015, the paper submission deadline is October 31, 2014. Please send to vlsitsa@itri.org.tw.

ED Xi'an

—by Yimen Zhang

Two Distinguished Lectures (DLs), invited by the IEEE ED Xi'an Chapter, were held in Xidian University, Xi'an, China, June 13th. There were more than 50 attendees of local professionals and graduate students. Prof. J. J. Liou, from the University of Central Florida, USA, delivered a DL entitled, *"Prospect and Outlook of Electrostatic Discharge (ESD) Protection in Emerging*



Prof. J. J. Liou giving his EDS Distinguished Lecture at Xidian University



Prof. Vijay Arora speaking at Xidian University, June 13, 2014

Technologies," which included the latest research achievements, such as the ESD protection in Silicon nanowire technology for low power and high frequency applications, organic technology for flexible electronic applications and GaN technology for high-power and high frequency applications. Prof. Vijay Arora, from Wilkes University, USA, presented his DL entitled, "*Carbon: The Soul of Future Nanoelectronics,*" on the transportation feature in carbon allotropes and Nonequilibrium Arora's Distribution Function (NEADF) in an electric field, leading to saturation velocity that is limited to the intrinsic Fermi velocity for carbon-based devices. Both of the DLs were excellent and received great interest and were highly appreciated. Each lecturer answered many valuable questions.

~Mansun Chan, Editor

ED Kansai

—by Michinori Nishihara

The ED Kansai Chapter held the 12th International Meeting for Future of Electron Devices, Kansai (2014IM-FEDK) at Ryukoku University Kyoto Hall, Kyoto, Japan, June 19–20, 2014, with the theme of "Innovative Electronics for Sustainable Society".

The meeting attracted 135 attendees and was preceded by a tutorial seminar with two distinguished lecturers: 1) "*Fundamentals of Biosensors and its Applications*" by Prof. Ichiro Yamashita of Nara Institute of Science and Technology (NAIST); and 2) "*Fundamentals of Thermoelectricity and its Application*" by Prof. Koji Miyazaki of Kyushu Institute of Technology.

The formal program followed the tutorial session with opening remarks by the general chair Prof. Yasuhisa Omura. The two day program

featured a keynote titled "*Micro Systems for Sustainable Society*" by Prof. Masayoshi Esashi of Tohoku University. There were two invited papers: 1) "*Understanding Carrier Transport in the Ultimate Physical Scaling Limit of MOSFETs*" by Prof. Hideaki Tsuchiya of Kobe University; 2) "*Power Electronics Innovation by Silicon Carbide Power Semiconductor Devices*" by Prof. Hajime Okumura of NAIST. In addition, there were 14 papers in three regular technical sessions and a poster session with 38 posters covering a wide range of topics for Silicon, Compound, Emerging, as well as Circuits and Systems. There were many student discussions in front of the posters.

At the end of the meeting the following awards were presented:

- IEEE EDS Kansai Chapter IMFEDK Best Paper Award to Chaichayan Kulchaisit, et al. of NAIST
- IEEE EDS Kansai Chapter IMFEDK Student Paper Award to Hiroshi Oka (Osaka University), Takuma Kobayashi (Kyoto University), Takuya Kakegami (University of Fukui), Go Wakimura (Osaka University), and Takahiro Yamaguchi (NAIST)

The award winners were congratulated warmly by all participants. IMFEDK will continue to encourage and contribute to our student members in the Kansai area by providing opportunities to present their ideas in English, hence extend their technical network to other Asian countries.



2014 IMFEDK Award Winners



2014 IMFEDK Poster Session



Prof Kaushio Roay at HITK, Calcutta

We will hold the annual Kansai Colloquium Electron Devices Workshop in November, 2014, in Osaka to review major papers published during the last 12 months. Please visit our homepage to find out more: <http://www.ieee-jp.org/section/kansai/chapter/eds/>.

~**Kuniyuki Kakushima, Editor**

ED/SSC Bangalore

~by Janakiraman V

The EDS/SSC Bangalore Chapter organized a technical talk on May 14th by James Warnock, IEEE Fellow from IBM, about the latest Z-mainframes in IBM. A number of circuit techniques were discussed which are not otherwise available in public domain. Some aspects of the Multi Chip Module mounted on a glass ceramic were also discussed. The talk was well attended by chapter members and professionals from

both industry and academia. It was a great opportunity for the audience to interact with the speaker and learn many important aspects of building enterprise server processors.

ED Calcutta

~by Soumya Pandit and Swapnadip De

The ED Calcutta Chapter organized a technical seminar based on Master of Engineering/Technology thesis 2014, June 12, 2014, at SMDP-II Laboratory, Electronics and Telecommunication Engineering Department, Jadavpur University. Three topics were presented: "*Performance Enhancement of Tunnel Field Effect Transistor: A Modeling and Simulation Study*" by Sayani Ghosh; "*Implementation of Different Circuit Level design Techniques for Reducing the Leakage Power*," by Debabrata Nadu and "*Design and simulation of RF circuits using LDMOS*," by Swarnil Roy. The seminar was attended by more than 50 students and faculty members, who benefited immensely from the seminar.

ED HIT-K Student Chapter, Calcutta

~by Atanu Kundu and Soumya Pandit

An EDS Distinguished Lecture (DL) on "*Nanoelectronics: A Bottom-up Approach to System Design*," by Prof. Kaushik Roy, Purdue University School of Electrical and Computer Engineering was held April 23rd, and jointly organized by the Department of Electronics and Communication

Engineering, HITK, the IEEE ED Calcutta Chapter, the Finishing School of TEQIP-II, the IEEE ED HITK Student Branch Chapter and the IEEE ED CU Student Branch Chapter at Heritage Institute of Technology, Calcutta. The talk was attended by more than 130 students and over 20 faculties. All of them benefited immensely from the talk.

ED University of Calcutta Student Chapter, Calcutta

~by Sarmista Sengupta and Soumya Pandit

The IEEE ED University of Calcutta Student Branch Chapter jointly organized two Distinguished Lectures (DLs) with the ED Calcutta Chapter and ED Heritage Institute of Technology (HITK) Student Branch Chapter.

The first DL held on April 8th, at Amitava Dey Memorial Hall, Department of CSE, Jadavpur University and the second on April 9th, at the University of Calcutta on "*Beyond Charge-Based Computing*," by Prof. Kaushik Roy of Purdue University and "*Approximate Computing for Energy-efficient Error-resilient Multimedia Systems*," by Edward G. Tiedemann Jr. of Purdue University. Prof. Roy spoke on the advantages of using spin as state variable for both memory and logic was discussed. Finally, the recent advances in other non-charge based computing paradigm such as magnetic quantum cellular automata were considered. The general topic of "*Approximate Computing*" was the main focus of the talk, including that of Energy-efficient Error-resilient



James Warnock at Bangalore
EDS/SSC Chapter

Multimedia Systems. Each of the lectures were attended by more than 80 students and 20 faculty members.

ED Kuala Lumpur, Malaysia

—by P Sushitha Menon

The IEEE ED Malaysia Chapter has been awarding the best Final Year Project (FYP) Award to micro and nanoelectronics engineering undergraduate students in local and private universities in Malaysia for the past 4 years. Winners will receive a certificate and RM100 monetary award. This year's project presentation was held, May 21, 2014, at the Faculty of Engineering, UKM, Kuala Lumpur. The Projects three separate focus groups: Microelectronics, Computer and Communications and Electrical Engineering, were awarded and the judges consisted of 4 industrial experts and 4 external academicians. For the Microelectronics degree program, there were a total of 15 posters presented. The "Best Project Award" was given to Khairul Akif Bin Mohd. Azmi from the Institute of Microengineering and

Nanoelectronics (IMEN), UKM, with the project entitled "*Fabrication and Characterization of Transparent Conductors based on Carbon Nanotube for Display Application.*"

At the Electronics and Computer Engineering Exposition (ECEX 2014) organized, May 19, 2014, at UTM, the IEEE ED Malaysia FYP Award in Microelectronics was bagged by Ms. Nor Farhana Ramli with her project entitled, "*Fabrication of Porous Silicon for pH-based Biosensor.*"

At the presentation held June 19, 2014, at the Department of Electrical & Computer Engineering, International Islamic University Malaysia (IIUM), the IEEE ED Malaysia Chapter awarded the best FYP in micro/nanoelectronics to Mr. Abdul Azim Rashid for the project entitled, "*Investigation on The Effects of Radiations on GaAs Solar Cell for Satellite Application.*"

ED Nepal

—by S P Byahut

The ED Nepal Chapter organized a technical talk on June 2, 2014, by Prof. S. N. Singh, Department of Electrical Engineering, IIT, Kanpur, India. The title of Prof. Singh's talk was, "*Recent Trend in Power System.*" It was organized jointly by the ED Nepal Chapter and faculty and students of the Institute of Engineering, Tribhuvan University. The program was well attended by LOCUS (a student wing of Electrical Engineering) and faculty members of Electrical and Electronics Engineering and IEEE members. There were 122 attendees for this program.

ED NIST Student Chapter, Berhampur

—by Ajit Kumar Panda

The IEEE ED NIST Student Chapter organized a one day seminar on "*Our Need and IEEE: Inception to Present Status,*" April 18, 2014, at the National Institute of Science & Technology, Palur Hill, Berhampur, for the young faculty members and researchers to enhance their research activity. Prof. Debatosh Guha, Chair, IEEE Kolkata Section, explained the need of professional membership and the benefits of being an active member. In his lecture entitled, "*Mother of Electronics*" he discussed the basic concepts and principles of antennas and different properties focusing towards wireless communication and transmission and their applications to create a new horizon for electronic industries. The lecture attracted 54 participants, including faculty members and M.Tech students from different institutes and universities.

~MK Radhakrishnan, Editor



Khairul Akif presenting his FYP Poster to the judges at UKM



Prof. D. Guha at ED NIST Student Chapter



Prof. Singh and attendees of the technical talk organized by the ED Nepal Chapter

EDS MEETINGS CALENDAR

(AS OF 14 SEPTEMBER 2014)



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

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

2014 IEEE Bipolar/BiCMOS Circuits and Technology Meeting - BCTM	28 Sep - 01 Oct 2014	Coronado Island Marriott Resort & Spa 2000 2nd Street Coronado, CA, USA
2014 25th European Symposium on Reliability of Electron Devices, Failure Physics and Analysis (ESREF)	29 Sep - 03 Oct 2014	Technische Universität Berlin Straße des 17. Juni 135 Berlin, Germany
2014 11th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE)	29 Sep - 03 Oct 2014	Universidad Autónoma del Carmen - Edificio del Centro de Vinculación Académica Calle 31 (Av. Aviación) corner with Av. Benito Juárez, Col Benito Juárez, C.P. 24180 Ciudad del Carmen, Campeche, Mexico
2014 IEEE SOI-3D-Subthreshold Microelectronics Technology Unified Conference (S3S)	06 Oct - 09 Oct 2014	Westin San Francisco Airport 1 Old Bayshore Highway Millbrae, CA, USA
2014 9th European Microwave Integrated Circuits Conference (EuMIC)	06 Oct - 07 Oct 2014	Nuova Fiera di Roma Via Portuense, 1645/647 Rome, Italy
2014 IEEE International Integrated Reliability Workshop (IIRW)	12 Oct - 16 Oct 2014	Stanford Sierra Conference Center Fallen Leaf Lake South Lake Tahoe, CA, USA
2014 International Semiconductor Conference (CAS)	13 Oct - 15 Oct 2014	Rina Sinaia Hotel 8, Carol I, Str Sinaia, Romania
2014 International Conference on Computer Aided Design for Thin-Film Transistor Technologies (CAD-TFT)	15 Oct - 17 Oct 2014	Nanjing, China
2014 IEEE Compound Semiconductor Integrated Circuit Symposium (CSICS)	19 Oct - 22 Oct 2014	Hyatt Regency La Jolla 3777 La Jolla Village Drive La Jolla, CA, USA

2014 10th International Conference on Advanced Semiconductor Devices & Microsystems (ASDAM)	20 Oct - 22 Oct 2014	Congress Center Smolenice Smolenice, Slovakia
2014 14th Non-Volatile Memory Technology Symposium (NVMTS)	27 Oct - 29 Oct 2014	Ramada Plaza Jeju Jeju Island, Korea (South)
2014 IEEE/ACM International Conference on Computer-Aided Design (ICCAD)	03 Nov - 06 Nov 2014	Hilton San Jose 300 S. Almaden Blvd. San Jose, CA, USA
2014 International Conference on Planarization/CMP Technology (ICPT)	19 Nov - 21 Nov 2014	Kobe International Conference Center Kobe, Japan
2014 6th World Conference on Photovoltaic Energy Conversion (WCPEC)	23 Nov - 27 Nov 2014	Kyoto International Conference Center Takaragaike, Sakyo-ku Kyoto, Japan
2014 IEEE 2nd International Conference on Emerging Electronics (ICEE)	04 Dec - 06 Dec 2014	J N Tata Auditorium, Indian Institute of Science Indian Institute of Science Bangalore, India
2014 IEEE 45th Semiconductor Interface Specialists Conference (SISC)	10 Dec - 13 Dec 2014	Catamaran Resort Hotel 3999 Mission Boulevard San Diego, CA, USA
2014 IEEE International Electron Devices Meeting (IEDM)	15 Dec - 17 Dec 2014	Hilton San Francisco San Francisco, CA, USA
2015 Joint International EUROSOI Workshop and International Conference on Ultimate Integration on Silicon (EUROSOI-ULIS)	26 Jan - 28 Jan 2015	aula prodi piazza san giovanni in monte 2 BOLOGNA, Italy
Abstract submission deadline: 01 Nov 2014 Final submission deadline: 15 Dec 2014 Notification of acceptance date: 20 Nov 2014		
2015 China Semiconductor Technology International Conference (CSTIC)	15 Mar - 16 Mar 2015	SHICC Shanghai International Convention Center No.2727 Riverside Avenue Pudong, Shanghai China

2015 IEEE Workshop on Microelectronics and Electron Devices (WMED)	20 Mar - 20 Mar 2015	Student Union Building Boise State University 1910 University Drive Boise, ID, USA
2015 International Conference on Microelectronic Test Structures (ICMTS) Abstract submission deadline: 31 Oct 2014 Final submission deadline: 31 Oct 2014 Notification of acceptance date: 19 Dec 2014	23 Mar - 26 Mar 2015	Doubletree by Hilton Phoenix Tempe 2100 So. Priest Dr. Tempe, AZ, USA
2015 IEEE International Reliability Physics Symposium (IRPS) Abstract submission deadline: 15 Oct 2014 Final submission deadline: 15 Jan 2015 Notification of acceptance date: 15 Dec 2014	19 Apr - 23 Apr 2015	Hyatt Regency Monterey Hotel & Spa 1 Old Golf Course Road Monterey, CA, USA
2015 International Symposium on VLSI Technology, Systems and Application (VLSI-TSA) Abstract submission deadline: 31 Oct 2014 Final submission deadline: 31 Oct 2014 Notification of acceptance date: 31 Dec 2014	27 Apr - 29 Apr 2015	The Ambassador Hotel 188 Chung Hwa Road, Section 2 Hsinchu, Taiwan
2015 International Symposium on VLSI Design, Automation and Test (VLSI-DAT) Abstract submission deadline: 24 Oct 2014 Final submission deadline: 31 Jan 2015 Notification of acceptance date: 31 Dec 2014	27 Apr - 29 Apr 2015	The Ambassador Hotel 188 Chung Hwa Road, Section 2 Hsinchu, Taiwan
2015 IEEE International Vacuum Electronics Conference (IVEC) Abstract submission deadline: 09 Jan 2015 Final submission deadline: 06 Mar 2015 Notification of acceptance date: 09 Feb 2015	27 Apr - 29 Apr 2015	Beijing International Convention Center No.8 Beichendong Rd., Chaoyang Dist. 100101, Beijing, China Beijing, China
2015 26th Annual SEMI Advanced Semiconductor Manufacturing Conference (ASMC) Abstract submission deadline: 31 Oct 2014 Full Paper Submission deadline: 03 Mar 2015 Final submission deadline: 20 Apr 2015 Notification of acceptance date: 19 Dec 2014	03 May - 06 May 2015	Hilton 534 Broadway Saratoga Springs, NY, USA

2015 IEEE 27th International Symposium on Power Semiconductor Devices & IC's (ISPSD) Abstract submission deadline: 20 Oct 2014 Final submission deadline: 02 Mar 2015 Notification of acceptance date: 22 Dec 2014	10 May - 14 May 2015	Kowloon Shangri-La, Hong Kong 64 Mody Road Tsim Sha Tsui East Kowloon Hong Kong
2015 IEEE International Memory Workshop (IMW)	17 May - 20 May 2015	Hyatt Regency Hotel 1 Old Golf Course Road Monterey, CA, USA
2015 IEEE International Conference on Electron Devices and Solid-State Circuits (EDSSC)	01 Jun - 03 Jun 2015	Singapore, Singapore
2015 IEEE 42nd Photovoltaic Specialists Conference (PVSC)	14 Jun - 19 Jun 2015	Hyatt Regency New Orleans 601 Loyola Avenue New Orleans, LA, USA
2015 IEEE SOI-3D-Subthreshold Microelectronics Technology Unified Conference (S3S)	05 Oct - 08 Oct 2015	DoubleTree by Hilton Sonoma Wine Country One DoubleTree Drive Rohnert Park, CA, USA
2015 IEEE Compound Semiconductor Integrated Circuit Symposium (CSICS) Abstract submission deadline: 01 May 2015 Final submission deadline: 17 Jul 2015 Notification of acceptance date: 29 May 2015	11 Oct - 14 Oct 2015	Sheraton New Orleans Hotel 500 Canal Street New Orleans, LA, USA
2015 IEEE 46th Semiconductor Interface Specialists Conference (SISC)	02 Dec - 05 Dec 2015	the Key Bridge Marriott 1401 Lee Highway Arlington, VA, USA
2015 IEEE International Electron Devices Meeting (IEDM) Abstract submission deadline: 26 Jun 2015 Final submission deadline: 22 Sep 2015 Notification of acceptance date: 14 Aug 2015	07 Dec - 09 Dec 2015	Hilton Washington Washington, DC, USA

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Kathryn was president and CEO of Jasper Design Automation, a profitable and fast-growing private company delivering formal verification solutions to semiconductor and systems companies. Jasper won the Red Herring Top 100 award for private companies in 2013. Kathryn sold Jasper to Cadence Design Systems for \$170M in 2014.

Ms. Kranen was awarded the prestigious EETimes and EDN 2013 ACE Lifetime Achievement Award for contributions to the electronics industry. She was named one of the Top Ten Women in Microelectronics by EETimes in 2011 and the 2005 recipient of the Marie Pistilli Women in Electronics Design Automation Award.

Thuy Dao, of Freescale Semiconductor and the EDS Women in Engineering Committee Chair, will be the event moderator.

For ticketing information, please visit the IEDM website: <http://www.his.com/~iedm/general/>