



The Grand Prince Hotel Hiroshima, where A-SSCC 2020 will be held.

with friends and colleagues, and enjoyed light entertainment.

### A-SSCC 2020

As of publication time, A-SSCC 2020 will be held at the Grand Prince Hotel, Hiroshima, Japan, 9–11 November 2020. Hiroshima is one of the most attractive cities in Japan and renowned for two World Heritage sites. The conference theme is Intelligent Chips for the AIoT Era. Due to COVID-19, travel and social distancing policies are changing daily. Please check the conference website for updates, [www.a-sscc2020.org](http://www.a-sscc2020.org).

—Tadahiro Kuroda

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## Highlights From ISSCC 2020

The 2020 International Solid-State Circuits Conference (ISSCC) was held 16–20 February 2020 at the San Francisco Marriott Marquis. The conference was jam packed with a wide array of forums, technical and tutorial presentations, short courses, an exciting plenary session, and opportunities to network with leading experts in the field. The 2020 conference chair was Jan Van der Spiegel, University of Pennsylvania, Philadelphia. Un-Ku Moon, Oregon State University, Corvallis, Oregon, was the 2020 technical program chair.

### Plenary Session

The plenary session, held 17 February 2020, was live streamed, so colleagues across the world who were not able to attend the conference in-person were able to do so virtually.

The plenary session began with welcoming remarks from Prof. Van der Spiegel, who gave a brief over-

view of the 2020 conference registration and spoke about 2020 conference highlights, including a new subcommittee on machine learning and artificial intelligence, industry sessions, highlighted chip releases, and lunch with mentors. This year, there were 206 technical presentations with a focus on advanced circuit techniques and benchmark results. Prof. Moon elaborated on ISSCC 2020 article acceptances. In 2020, there were a total of 633 submitted papers of which 206 were accepted (a 32% acceptance rate). He also talked about the ISSCC app, which enables viewing and rating of papers.

The 2020 plenary session featured four distinguished speakers:

- Jeff Dean, Google, Mountain View, California
- Kou-Hung Lawrence Loh, MediaTek, Hsinchu, Taiwan
- Nadine Colbert, imec, Leuven, Belgium
- Dario Gil, IBM Thomas J. Watson Research Center, Yorktown Heights, New York.

Dean presented the talk “The Deep Learning Revolution and Its Implications for Computer Architecture and Chip Design.” He discussed recent advances in deep learning and presented ways that machine learning may be able to help with aspects of the design process.

*The plenary session was live streamed, so colleagues across the world who were not able to attend the conference in-person were able to do so virtually.*

Loh’s address, “Fertilizing AIoT From Roots to Leaves,” gave insights into how new opportunities are created for items in the world of the Artificial Intelligence of Things (AIoT).

He explained the challenges and opportunities for the industry if we want to have more than 350 billion connected intelligent devices by the end of the next decade. Loh's talk was followed by the awards presentation.

### Awards

The following awards were presented during the plenary session at ISSCC 2020:

- The 2019 Lewis Winner Award for Outstanding Paper was given to Benjamin Hershberg, Davide Dermit, Barend van Liempd, Ewout Martens, Nareo Markulic, Jorge Lagos, and Jan Craninckx for "A 3.2-GS/s 10 ENOB 61-mW Ringamp ADC in 16 nm With Background Monitoring of Distortion."
- The 2019 Lewis Winner Award for Outstanding Paper also went to

Stefano Pellerano, Steven Callender, Woorim Shin, Yanjie Wang, Somnath Kundu, Abhishek Agarwal, Peter Sagazio, Brent Carlton, Farhana Sheikh, Arnaud Amadjikpe, William Lambert, Divya Shree Vemparala, Mark Chakravorti, Satoshi Suzuki, Robert Flory, and Chris Hull for "A Scalable 71-to-76-GHz 64-Element Phased-Array Transceiver Module with  $2 \times 2$  Direct-Conversion IC in 22-nm FinFET CMOS Technology."

- The 2019 Anantha P. Chandrakasan Distinguished Technical Paper Award went to "A 769-uW Battery-Powered Single-Chip SoC with BLE for Multi-Modal Vital Sign Health Patches" by Mario Konijnenburg, Roland van Wegberg, Shuang Song, Hyunsoo Ha, Wim Sijbers, Jiawei

Xu, Stefano Stanzione, Chris van Liempd, Dwaipayan Biswas, Arjan Breeschoten, Peter Vis, Chris Van Hoof, and Nick Van Helleputte.

- The 2019 Jan Van Vessem Award for Outstanding European Paper was presented to Robert K. Henderson, Nick Johnston, Sam W. Hutchings, Istvan Gyongy, Tarek Al Abbas, Neale Dutton, Max Tyler, Susan Chan, and Jonathan Leach for the paper "A  $256 \times 256$  40-nm/90-nm CMOS 3D-Stacked 120-dB Dynamic-Range Reconfigurable Time-Resolved SPAD Imager."
- The 2019 Takuo Sugano Award for Outstanding Far-East Paper was given to "Background Capacitor-Current-Sensor Calibration of DC-DC Buck Converter with DVS for Accurately Accelerating Load-Transient



Jan Van der Spiegel, ISSCC 2020 conference chair, welcomes conference attendees during the plenary session.



The winner of the 2020 IEEE Frederik Phillips Award, Kazuo Yano (left), with IEEE Past President Jim Jeffries (right).



The Class of 2020 IEEE Fellows recognized at ISSCC 2020 with IEEE Solid-State Circuits Society (SSCS) President Kenneth O (far left) and IEEE Past President Jim Jeffries (far right).

Response” by Tai-Haur Kuo, Yi-Wei Huang, and Pan-Yi Wang.

- The 2019 Jack Kilby Award for Outstanding Student Paper went to Ahmed El Shater, Calvin Yoji Lee, Praveen Kumar Venkatachala, Jason Muhlestein, Spencer Leuenberger, Kazuki Soube, Koichi Hamashita, and Un-Ku Moon for their paper “A 10-mW, 16-b, 15-MS/s Two-Step SAR ADC with 95-dB DR Using Dual-Deadzone Riling-Amplifier.”
- The recipients of the 2019 ISSCC Award for Outstanding Forum Presenter were Ming Wu for “LiDAR Sensor Systems” and Didem Turker for “Clock Generation and Distribution for 56-Gb/s, 112-Gb/s, and Beyond Serial Links.”
- The 2019 Evening Session Award went to “Moving to the Dark Side.”

The organizer was Jan Westra, the organizer/moderator was Matt Straayer, and the panelists were Dave Dwelley, Kave Kianush, Curtis Lang, Jen Lloyd, Tyson Tuttle, and Patrick Yue, with special appearances by Laura Fujino, Chris Mangelsdorf, and Bram Nauta.

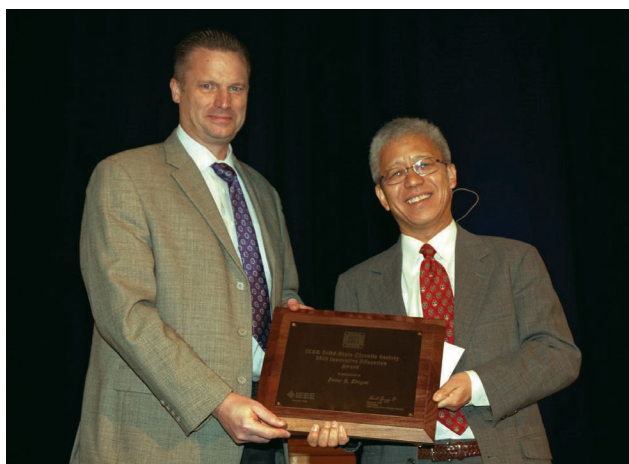
- The 2019 Demonstration Session Certificate of Recognition was presented to Stefano Pellerano, Steven Callender, Woorim Shin, Yanjie Wang, Somnath Kundu, Abhishek Agrawal, Peter Sagazio, Brent Carlton, Farhana Sheikh, Arnaud Amadjikpe, William Lambert, Divya Shree Vemparala, Mark Chakravorti, Satoshi Suzuki, Robert Flory, and Chris Hull for “A Scalable 71-to-76-GHz, 64-Element Phased-Array Transceiver Module with  $2 \times 2$

Direct-Conversion IC in 22-nm Fin-FET CMOS Technology.”

- The 2019 Demonstration Session Certificate of Recognition went to “AI x Robotics: Technology Challenges and Opportunities in Sensors, Actuators, and Integrated Circuits” by Masahiro Fujita and to “An 80-Gb/s, 300-GHz-Band Single-Chip CMOS Transceiver” by Sangyeop Lee, Ruibing Dong, Takeshi Yoshida, Shuhei Amakawa, Shinsuke Hara, Akifumi Kasamatsu, Junji Sato, and Minoru Fujishima.
- In addition, the 2019 Demonstration Session Certificate of Recognition was awarded to Jinsu Lee, Juhyoung Lee, Donghyeon Han, Jinmook Lee, Gwangtae Park, and Hoi-Jun Yoo for “LNPU: A 25.3-TFLOPS/W Sparse Deep-Neural-Network Learning



The winner of the 2020 Donald O. Pederson Award, Klaas Bult (left), with Jim Jeffries.



The winner of the 2020 IEEE SCS Innovative Education Award, Peter Kinget (left), with Kenneth O.



The winner of the 2020 IEEE SCS Industry Impact Award, Vivek De (left), with Kenneth O.



The winner of the 2020 SCS New Frontier Award, Nan Sun (left), with Kenneth O.

Processor with Fine Grained Mixed Precision of FP8/FP16” and to Yao-Hong Liu, Sunil Sheekavant, Marco Mercuri, Paul Mateman, Johan Dijkhuis, Wilfried Zomagboguelou, Arjan Breeschoten, Stefano Trafferro, Yan Zhan, Tom Torf, Chris-

tian Bachmann, Pieter Harpe, and Masoud Babaie for “A 680-uW-Chirp UWB Radar Transceiver for Vital Signs and Occupancy Sensing up to 15-m Distance.”

After the presentation of the ISSCC Awards, IEEE Solid-State Circuits Soci-

ety (SSCS) President Kenneth O spoke about the many benefits of joining the Society. These include access to Society publications and educational content such as webinars and tutorials, registration discounts at SSCS-sponsored conferences and events, and networking



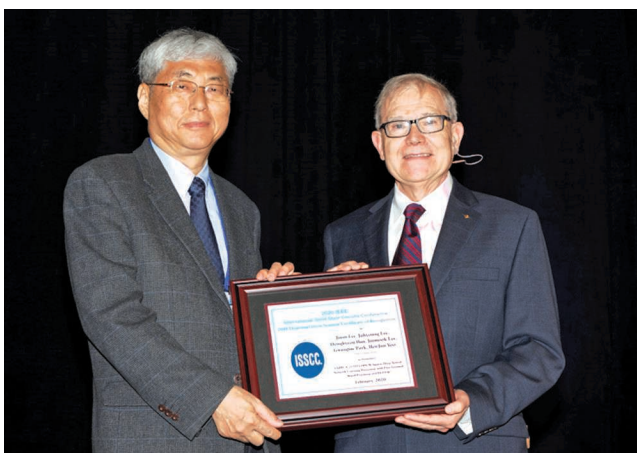
The winner of the Brokaw Award, Matthias Eberlein (center), with Kenneth O (left) and Paul Brokaw (right).



The 2019 Demonstration Session Certificate of Recognition recipients with Jan Van der Spiegel (right).



The winner of the 2019 SSCS Outstanding Chapter Award was the Italy Chapter. Piero Malcovati (left) accepted the award on behalf of the Chapter.



Demonstration Session Certificate of Recognition recipient with Jan Van der Spiegel (right).



SSCS President Kenneth O speaks about Society benefits during the plenary session.



2019 Demonstration Session Certificate of Recognition recipients with Jan Van der Spiegel (right).

opportunities for Young Professionals and higher-level members.

The IEEE Technical Field Awards were then presented by IEEE Past President Jim Jeffries.

- The 2020 IEEE Donald O. Pederson Solid-State Circuits Award was awarded to Klaas Bult, Delft University of Technology, The Netherlands.
- The 2020 IEEE Frederik Philips Award went to Kazuo Yano, Hitachi, Japan.

### SSCS Awards

The SSCS Awards were presented by Kenneth O and Bram Nauta, SSCS past president.

- The 2020 IEEE Brokaw Award for Circuit Elegance was awarded to Matthias Eberlein, Intel, Germany.
- The 2020 IEEE SSCS New Frontier Award was given to Nan Sun, University of Texas at Austin.

- The 2020 IEEE SSCS Innovative Education Award was presented to Peter R. Kinget, Columbia University, New York.
- The 2020 IEEE SSCS Industry Impact Award was given to Vivek De, Intel.
- The 2018 Journal of Solid-State Circuits Best Paper Award honored “A 6.9- $\mu\text{m}$  Pixel-Pitch Back-Illuminated Global Shutter CMOS Image Sensor With Pixel-Parallel 14-Bit Subthreshold ADC,” published in the November 2018 issue of *IEEE Journal of Solid-State Circuits*, vol. 53, no. 11, pp. 3017–3025. The authors are Masaki Sakakibara, Koji Ogawa, Shin Sakai, Yasuhisa Tochigi, Katsumi Honda, Hidekazu Kikuchi, Takuya Wada, Yasunobu Kamikubo, Tsukasa Miura, Masahiko Nakamizo, Naoki Jyo, Ryo

Hayashibara, Shinya Miyata, Satoshi Yamamoto, Yoshiyuki Ota, Hirotsugu Takahashi, Tadayuki Taura, Yusuke Oike, Keiji Tatani, Takayuki Ezaki, and Teruo Hirayama.

### SSCS Fellows

The following SSCS members were recognized as members of the IEEE Fellows Class of 2020.

- *William Bidermann*: For leadership in commercially successful image sensors and microprocessors
- *Michael Perrott*: For contributions to phase-locked loop integrated circuits
- *Pavan Kumar Hanumolu*: For contributions to the design of mixed-signal integrated circuits
- *Eric A. M. Klumperink*: For contributions to thermal noise canceling and software-defined radio architecture



The 2019 Demonstration Session Certificate of Recognition recipient with Jan Van der Spiegel (right).



The recipients of the 2019 ISSCC Evening Session Award with Jan Van der Spiegel.



The 2019 Demonstration Session Certificate of Recognition recipients with Jan Van der Spiegel.

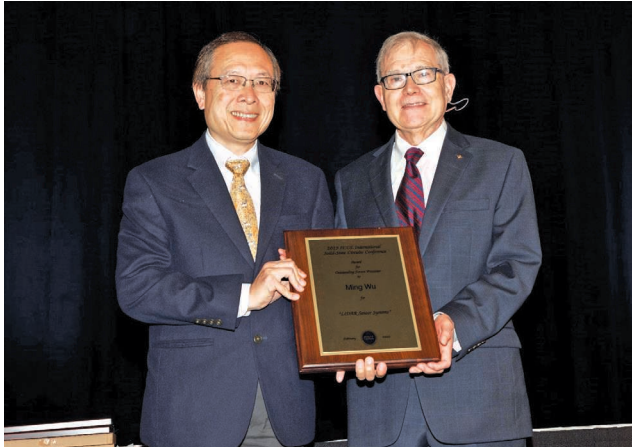


A recipient of the 2019 Outstanding Forum Presenter Award, Didem Turker (left), with Jan Van der Spiegel.

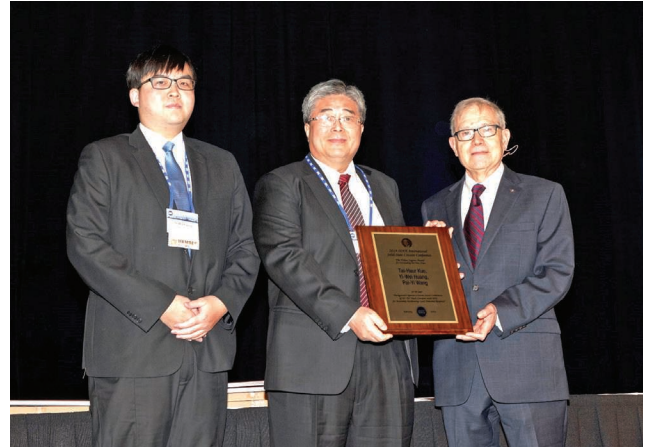
■ *Yiannos Manoli*: For contributions to the design of integrated analog-to-digital interface circuits and energy harvesting systems

■ *Masoud Zargari*: For contributions to the development of CMOS radio-frequency integrated circuits

■ *Ramon Carvajal*: For contributions to low-voltage and low-power CMOS analog circuit design



A recipient of the 2019 Outstanding Forum Presenter Award, Ming Wu (left), with Jan Van der Spiegel.



The recipients of the 2019 Takuo Sugano Award for Outstanding Far-East Paper with Jan Van der Spiegel.



The recipients of the 2019 Jack Kilby Award for Outstanding Student Paper with Jan Van der Spiegel.



The recipients of the 2019 Jan Van Vessel Award for Outstanding European Paper with Jan Van der Spiegel.



The recipients of the 2019 Anantha P. Chandrakasan Award for Outstanding Distinguished Technical Paper with Jan Van der Spiegel.



Recipients of the 2019 Lewis Winner Award for Outstanding Paper with Jan Van der Spiegel.



Recipients of the 2019 Lewis Winner Award for Outstanding Paper with Jan Van der Spiegel.

- *Jose De La Rosa*: For contributions to delta-sigma modulators
- *Huazhong Yang*: For low-power circuit techniques for sensor applications and design automation
- *Barbara De Salvo*: For contributions to device physics of nonvolatile embedded and stand-alone memories
- *Bich-yen Nguyen*: For contributions to silicon-on-insulator technology
- *Ravi Todi*: For contributions to innovative design and commercialization of high-performance eDRAM
- *Ullrich Pfeiffer*: For development of silicon-based millimeter-wave and terahertz circuits and systems
- *Jae-sung Rieh*: For contributions to silicon-germanium integrated circuits for wireless communications.

The recipient of the 2019 SSCS Outstanding Chapter Award was the SSCS Italy Chapter. Chapter Chair

Andrea Baschiroto accepted the award on behalf of the Chapter.

After the awards presentation, there was a short break before presentations by the two remaining plenary speakers.

### Plenary Session, Continued

Nadine Colbert gave the talk “Future Scaling: Where Systems and Technology Meet.” She explained why a rethinking of what the semiconductor industry now calls *scaling* is needed to address a smart society where things are connected.

Dario Gil presented “The Future of Computing: Bits + Neurons + Qubits.” Gil talked about the future of computing, built upon bits + neurons + qubits and programmable quantum computers.

After the last talk, plenary speakers were given award plaques.

—Abira Altvater

## Evening Sessions

### Student Research Preview

- *Cochairs*: Denis Daly, Omni Design Technologies, Massachusetts, and Jerald Yoo, National University of Singapore.
- *Secretary*: Tinoosh Mohsenin, University of Maryland
- *Advisors*: Jan Van der Spiegel, University of Pennsylvania, and Anantha Chandrakasan, Massachusetts Institute of Technology (MIT)
- *Media/publications*: Laura Fujino, University of Toronto
- *A/V*: Trudy Stetzler, Halliburton, Houston, Texas
- *Committee members*: Jason Anderson, University of Toronto; Masoud Babaie, Delft University of Technology, The Netherlands; Andrea Baschiroto, University of Milan-Bicocca, Italy; Hsin-Shu Chen, National Taiwan University; Hayun Chung, Korea University; Shidhartha Das, ARM, United Kingdom; Zeynep Deniz, IBM, New York; Hao Gao, Eindhoven University of Technology, The Netherlands; Minkyu Je, KAIST, Korea; Matthias Kuhl, Hamburg University of Technology, Germany; Seulki Lee, imec, The Netherlands; Yoonmyung Lee, SungKyunKwan University, Korea; Qiang Li, University of Electronic Science and Technology, China; Shih-Chii Liu, University of Zurich/ETH Zurich, Switzerland; Carolina Mora Lopez, imec, Belgium; Shahriar Mirabbasi,



Prof. Tadahiro Kuroda gave a short talk at the ISSCC SRP 2020.



The ISSCC 2019 SRP Poster Award winner, Alessio Santiccioli (left), with Denis Daly.



The 2020 Silkroad Award winner, Donguk Kim (left) with Makoto Takamiya.



Denis Daly gives his welcoming remarks at ISSCC SRP 2020.

University of British Columbia, Canada; Cormac O'Connell, TSMC, Canada; Mondira Pant, Intel, Massachusetts; Negar Reiskarimian, MIT; Jae-sun Seo, Arizona State University; Atsushi Shirane, Tokyo Institute of Technology; Yildiz Sinangil, Apple, California; GuoZing Wang, Shanghai Jiao Tong University, China; Jeffrey Weldon, University of Hawaii; Chia-Hsiang Yang, National Taiwan University; Rabia Tugce Yazicigil, Boston University; Samira Zaliasl, Ferric, New York; and Milin Zhang, Tsinghua University, China.

The Student Research Preview (SRP) at ISSCC 2020 was held on 16 February 2020 and brought eager students to San Francisco. The program highlighted selected student research projects by graduate students from around the world. Selection was based on the work's technical quality and innovation. The session began with a welcome and introduction by SRP cochairs, Denis Daly and Jerald Yoo. Afterward, award recipients for the 2020 SSCS predoctoral fellowships and the 2020 ISSCC/SSCS student travel grant were acknowledged. In addition, the 2020 Silkroad Award and ISSCC 2019 SRP Award were given. The award ceremony was followed with a talk by Prof. Tadahiro Kuroda, University of Tokyo, "The Lessons of History: Sometimes It's The Very People Who No One Can Imagine Anything Of



The 2020 ISSCC/SSCS Student Travel Grant recipients. First row (from left): Omiya Hassan, Yasemin Engur, Ava Hedayatipour, Jiamin Li, Qiu Junjun, Qijun Liu, Soyeong Shin, Joanne Tan, and Fatemeh Marefat. Second row (from left): Nirmoy Modak, Shiyu Su, Eunchul Kang, Shrestha Bansal, Su Yuqi, Shaghayegh Aslanzadeh, Reza Erfani, Ahmad Rezvanitabar, and Vasant Iyer. Not pictured: Debayan Das, Chao Fan, Nimrod Ginzberg, Yu Gong, Yeseul Jeon, Sujin Park, Saransh Sharma, Alexander Sheldon, Pengfei Zhai, and Yuke Zhang.



The 2020 SSCS Pre-Doctoral Fellowship winners. First row (from left): Kaizhe Guo, Tzu-Fan Wu, Seyeon Yoo, Minchang Cho, Hesam Sadeghi Gougheri, Xuyang Lu, Fei Wang, Bishnu Patra, and Cheng Wang. Second row (from left): Mahmoud Elhebeary, Athanasios Ramkaj, Karim Megawar, Sujun Gonugondla, Tianyu Jia, Wenda Zhao, and Pouyan Bassirian. Not pictured: Sining Pan, Reza Pazhouhandeh, Mahmoud Mahdipour Pirbazari, and Haosheng Zhang.



**Prof. Kuroda concluded his talk with the inspiring quote in the title from Alan Turing to encourage the audience to believe in their ability to create the innovations for driving the next paradigm shift in computing.**

Who Do The Things No One Can Imagine.” Prof. Kuroda’s talk started with a summary of the history of the computer and ICs, explaining how it started with wired-logic computers built with vacuum tubes and evolved into the modern-day von Neumann stored-program computers constructed with ICs. He also spoke about the rebirth of AI in the form of neural networks to achieve brain-like efficiency in intuitive and spatial processing. He presented some ideas for future inventions, such as a digital grandchild looking after grandma, flying vehicles, and a brain camera, while quoting guiding words of wisdom from notable scientists and technologists. Prof. Kuroda concluded his talk with the inspiring quote in the title from Alan Turing to encourage the audience to believe in their ability to create the innovations for driving the next paradigm shift in computing.

Following Prof. Kuroda’s lecture, each SRP student was given 1 min to present his or her research to the audience. The talks focused on three sessions:

- Machine Learning and Digital (Chairs: Yildiz Sinangil and Jason Anderson)
- Biomedical and Analog (Chairs: Minkyu Je and Carolina Mora Lopez)
- Communications and Radio Frequency (Chairs: Hao Gao and Negar Reiskarimian).

After the student presentations, there was a poster session where attendees could take an in-depth look at the students’ research. The poster



**SRP Session 1 participants (from left): Niteesh Manjunath, Morteza Hosseini, Ji-Hoon Kim, Yildiz Sinangil, Jason Anderson, Kwangho Lee, and Minxiang Gong. Not pictured: Aminah Hina, Gicheol Shin, Jianxun Yang, and Yu Gong.**



**SRP Session 2 participants. First row (from left): Junho Boo, Baibhab Chatterjee, Chanmin Park, Rajkumar Kubendran, Joanne Tan, and Taghoon Jeong. Second row (from left): Han Hao, Carolina Mora Lopez, and Minkyu Je. Not pictured: Dongyang Jiang.**



**SRP Session 3 participants. First row (from left): Nimrod Ginzberg, Nimroy Modak, Hyunjin Ahn, Zheng Li, Guoxiang Han, and Yuncheng Zhang. Second row (from left): Hao Gao, Negar Reiskarimian, and Alessio Santiccioli. Not pictured: Zonglin Ma.**



**The SRP Committee. First row (from left):** Negar Reiskarimian, Tinoosh Mohsenin, Jan Van der Spiegel, Yildiz Sinangil, Minkyu Je, Jason Anderson, and Lauren Fujino. **Second row (from left):** Hao Gao, Atsushi Shirane, Anantha Chandrakasan, Shahriar Mirabbasi, Denis Daly, and Chia-Hsiang Yang.

session chairs were Chia-Hsiang Yang and Rabia Yazicigil.

—Abira Altvater

### Rising to the Top at ISSCC 2020: Rising Stars Workshop

- **Chair:** Farhana Sheikh (Intel, Oregon)
- **Vice-Chair:** Rabia Tugce Yazicigil (Boston University)
- **Committee:** Zeynep Deniz, IBM; Dina R. El-Damak, University of Southern California; Q. Jane Gu, University of California, Davis; Ulkuhan Guler, Worcester Polytechnic Institute, Massachusetts; Alicia Klinefelter; Rikky Muller, University of California, Berkeley; Negar Reiskarimian, MIT; Yildiz Sinangil, Apple; Trudy Stetzler,

Halliburton; Alice Wang, Everactive; and Kathy Wilcox, Advanced Micro Devices (AMD).

- **Advisory Board:** Tsu-Jae K. Liu, University of California, Berkeley; Andrea Goldsmith, Stanford University; and Anantha Chandrakasan, MIT.

The Rising Stars 2020 workshop, cosponsored by the ISSCC and the SSCS Women in Circuits (WiC) committee, included an invitation-only event for 20 selected Rising Stars and two parallel public academia and industry career panels, “Navigating the Assistant Professorship” and “Rising to the Top in Industry.” The evening career panels were made open to the public, and both ISSCC conference attendees and local

engineers and students participated. There was a special invitation-only poster session, networking event, dinner, and mentoring session for the selected 20 Rising Stars in academia and industry. The Rising Stars were chosen based on stringent criteria that included their research, recommendation letters, and personal and diversity statements.

The Rising Stars were encouraged to present posters and network with ISSCC and WiC committee members. During the dinner, Prof. Anantha Chandrakasan, dean of the MIT School of Engineering, and Vannevar Bush, professor in the Department of Electrical Engineering and Computer Science at MIT, conducted a fireside chat with Rabia Yazicigil, Boston University, during the invitation-only dinner event. Prof. Chandrakasan shared his professional experience, starting from the beginning of his career when he was a graduate student or a young professional like the Rising Stars. He talked about the academic Rising Stars workshop he created at MIT in 2012 and how he encourages diversity in the MIT School of Engineering. The audience was listened attentively to Prof. Chandrakasan’s advice and asked extremely probing questions. Following the dinner and fireside chat, the Rising Stars sat at different topic tables to get speed-mentoring on topics ranging from academic careers, pursuing doctoral



The poster session at the Rising Stars Evening Event.



The Rising Stars Evening Event: fireside chat with Anantha Chandrakasan (left) and Rabia Tugce Yazicigil.

degrees, interviewing for industry jobs, and deciding between academia and industry when pursuing a career.

The evening career panels open to public attendance consisted of six experts from academia and industry—across Asia, Europe, and North America—in the field of ICs. During the industry panel, speakers representing businesses ranging from small start-up organizations to large corporations, including corporate research labs, brought their own experiences and perspectives on how to successfully navigate career path challenges. The panel was moderated by Dr. Alicia Klinefelter (NVIDIA) and Dr. Zeynep Deniz (IBM) and began with a distinguished speaker presentation by Dr. Alice Wang (Everactive). The diverse panelists who gave their views on what it takes to succeed in industry consisted of Dr. Farhana Sheikh (Intel), Dr. Mike Mulligan (Silicon Labs), Dr. Kazuko Nishimura (Panasonic), Dr. Walker Turner (NVIDIA), and Dr. Laura Fick (Mythic AI). Industry panelists also fielded challenging questions including how to deal with difficult employees and managers, plan for career growth, and handle challenging situations. Industry panel attendance was estimated to be about 120 participants.

Academia panelists discussed the hiring process, tenure requirements, and work–life balance. Prof. Azita Emami from the California Institute of Technology kicked off the panel by sharing with panel attendees her “words of wisdom” on navigating a successful academic life even when we face hurdles and failures. The panel was led by moderators Prof. Dina Reda El-Damak (University of Southern California) and Prof. Jane Gu (University of California, Davis). The panelists were Prof. Vivienne Sze (MIT), Prof. Esther Rodriguez Villegas (Imperial College London), Prof. Jerald Yoo (National University of Singapore), Prof. Zhengya Zhang (University of Michigan), Prof. Milin Zhang (Tsinghua University), and Prof. Azita

Emami (California Institute of Technology). Academia panel attendance was also strong and estimated to be about 100 participants.

—*Rabia Tugce Yazicigil and  
Farhana Sheikh*

### Industry Showcase at the ISSCC 2020

- *Chair:* Kush Gulati (Omni Design, Milpitas, California)
- *Cochair:* Alice Wang (Everactive, Santa Clara, California)
- *Acting Cochair:* Alison Burdett (Sensium Healthcare, Oxford, United Kingdom).
- *Committee members:* Alison Burdett, Sensium Healthcare, Oxford, United Kingdom; Matteo Bassi, Infineon Technologies AG, Villach, Austria; Tom Burd, Advanced Micro Devices, Santa Clara, California; Vivek De, Intel, Hillsboro, Oregon; Yohan Frans, Xilinx, San Jose, California; Nagendra Krishnapura, Indian Institute of Technology, Chennai; Sonia Leon, Intel, Santa Clara, California; Yan Li, Western Digital, Milpitas, California; Patrick Mercier, University of California, San Diego; James Myers, ARM, Cambridge, United Kingdom; Mijung Noh, Samsung Electronics, Gyeonggi-do, Korea; Phillip Restle, IBM T.J. Watson, Yorktown Heights, New York; Naveen Verma, Princeton University, New Jersey; Long Yan, Samsung Electronics, Gyeonggi-do, Korea; and Wookyeong Jeong, Samsung Electronics, Gyeonggi-do, Korea.

Semiconductor chips are becoming increasingly complex, owing to ever-higher levels of systems integration. These SoCs are increasingly critical in enabling some remarkable systems and products with far-reaching societal impact, ranging across industries, such as next-generation cellular infrastructure, robotics, autonomous vehicles, and quantum computers. ISSCC is the premier forum to present such advances in solid-state circuits and systems. The ISSCC industry showcase, first introduced in 2018 on the 65th anniversary

of the ISSCC, was created to highlight novel systems and products enabled by such leading-edge solid-state circuits.

This year, the industry showcase included participation by 14 different companies from a mix of larger corporations and start-ups selected through an open submission process, followed by voting by the program committee. It featured opening remarks by Kush Gulati and Alison Burdett, followed by short presentations by the industry participants, while Prof. Un-Ku Moon, ISSCC program chair, presented each of the participants a Technology Innovation Award.

The pitches were followed by interactive demonstrations, where attendees could have hands-on experience with each featured innovation. Showcase exhibits included demonstrations of using integrated circuits for specific applications, including cutting-edge processors, machine learning, health care, human interface, the Internet of Things (IoT), mobile/cellular, image sensors, and next-generation automotive.

Companies participating in the showcase included the following:

- Intel, Portland, Oregon, showcasing the Lakefield processor with hybrid computing and 3D stacking to enable the industry’s first mobility PC product in a 12 × 12 (mm<sup>2</sup>) package-on-package form factor
- Wiliot, Caesarea, Israel, demonstrating fully passive Bluetooth SoCs to enable low-cost auto-identification tags that can harvest radio-frequency energy from Bluetooth Low Energy beacons. The demonstration showed the devices being used in a sticker format on wine bottles for a merchandizing application.
- IBM Systems and Technology, Poughkeepsie, New York, presenting IBM’s z15 microprocessor and system control chips built in a 14-nm technology with significant improvements in cache density and system performance
- Butterfly Network, Inc., Guilford, Connecticut, demonstrating Butterfly

iQ, the first Food and Drug Administration-cleared and Confor-  
mité Européenne-approved “one  
probe, whole body imaging” medi-  
cal ultrasound device that plugs  
directly into a smartphone and is  
offered at a 50-fold lower price tag  
than existing solutions (demon-  
stration included live scanning on  
human bodies)

- Weebit Nano, Hod HaSharon, Is-  
rael, presenting third-generation  
neuromorphic computing imple-  
mented using analog neurons and  
resistive synapses-based, with  
spiking neural networks shown in  
a live demonstration
- Samsung Semiconductor, Hwaseong-  
si, Korea, demonstrating its sec-  
ond-generation time-of-flight-  
based image sensor using four-tap,  
7- $\mu\text{m}$  global-shutter time-of-flight  
pixel technology currently in mass  
production
- Samsung Electronics, Bengaluru,  
India, exhibiting a 108-mP CMOS  
image sensor that they believe is  
the world’s first commercial such  
sensor for mobile phones, with  
resolution comparable to high-end  
digital single-lens reflex cameras
- Samsung Electronics, Hwaseong-si,  
Korea, demonstrating (using a live  
FM radio reception) a blocker-tol-  
erant direct-sampling receiver that  
includes a current-reuse low-noise  
amplifier and a digital-assisted ana-  
log-to-digital converter designed for  
a wireless FM mobile radio system
- Ferric, New York, showcasing its  
Fe1202 product, which it believes is  
the first single-chip buck converter  
with fully integrated ferromagnet-  
ic inductors and a powertrain that  
achieves a current density exceed-  
ing 2 A/mm<sup>2</sup>
- Texas Instruments, Bengaluru, India,  
demonstrating the key algorithmic  
elements needed to enable auton-  
omous parking using surround-cam-  
era perception with a single high-  
performance, cost- and power-efficient  
16-nm SoC (with both camera per-  
ception and 3D surround view dem-  
onstrated live on the SoC)
- AMD, Santa Clara, California, dem-  
onstrating key AMD Navi technolo-

gies showcasing real-world benefits  
of PCIe Gen 4 speeds, overclocking  
capabilities, power efficiency for  
gaming, and CPU and GPU coopera-  
tive power management in a mobile  
form factor

- Western Digital Research, Milpitas,  
California, showing a parking-  
mode security surveillance sys-  
tem that deters and records vehi-  
cle break-ins, leveraging the state  
of art in IoT and artificial intelli-  
gence technology
- MediaTek, Hsinchu Taiwan, dem-  
onstrating an AI-based video su-  
perresolution application on the  
deep learning accelerator in its 5G  
smartphone SoC, showcasing the  
performance and power efficiency  
of its accelerator solution
- Alibaba Group, Sunnyvale, Califor-  
nia, providing a live demonstration  
of its newly announced Hanguang  
800, a cloud inference chip built  
on 12 nm, soon to be deployed to  
their data centers to accelerate AI  
applications, such as smart city,  
image-based search, and medical  
image processing.

—Kush Gulati

### Is an Open Source Hardware Revolution on the Horizon?

- *Organizers:* Naveen Verma, Princ-  
eton University, New Jersey; Tanay  
Karnik, Intel, Hillsboro, Oregon; Kush Gu-  
lati, Omni Design Technologies, Cali-  
fornia; Sudip Shekhar, the University  
of British Columbia, Canada; and Ra-  
bia Yazicigil, Boston University.
- *Moderator:* Denis Daly, Omni De-  
sign Technologies, Massachusetts.

Open source has revolutionized  
software, fostering innovation and  
enhancing productivity. Hardware  
design is complex in distinct ways,  
which, on the one hand, make such  
progression necessary but, on the  
other hand, institute completely new  
challenges. Are the challenges show-  
stoppers or just new ways of thinking  
and engineering? If open source hard-  
ware could be attained, what would it  
look like, and would there be signifi-  
cant up-side (e.g., compared to today’s  
intellectual property licensing)? What-  
ever the answers, the success of open  
source hardware will require align-  
ment, partnership, and collective will  
across the hardware ecosystem, from  
design, to methodologies, to business  
models. This evening session brought  
together panelists representing and  
debating from these different per-  
spectives to make and break the case.

The event was moderated by Denis  
Daly and included a distinguished  
group of panelists including Rob Ait-  
ken of ARM, Elad Alon of the University  
of California, Berkeley/Blue Cheetah,  
Brucey Khailany of NVIDIA, Sailesh  
Kottapalli of Intel, Shichin Ouyang of  
MediaTek, David Patterson of the Uni-  
versity of California, Berkeley/Google,  
and Davide Rossi of the University of  
Bologna. Throughout the event, the  
audience was asked to vote on ques-  
tions, such as how far away we are  
from an open source hardware revolu-  
tion. Some notable panel discussions  
included whether industry, academia,  
or start-ups would be the leaders in  
bringing about a revolution and how  
the tremendous adoption of reduced  
instruction set computer standards



The evening session panelists debated the open source hardware revolution (from left): Davide Rossi, Kush Gulati, Denis Daly, Elad Alon, David Patterson, Brucey Khailany, Shichin Ouyang, Rob Aitken, Rabia Yazicigil, and Tanay Karnik.

will impact the industry and how ARM will respond.

—Denis Daly

### The Smartest Designer in the Universe

- **Organizers:** Massimo Alioto, National University of Singapore; Denis Daly, Omni Design Technologies, Massachusetts; Tinoosh Mohsenin, University of Maryland; Alex Moreno, University of California, Berkeley; Mandy Pantel, Intel; Tim Piessens, IC-sense, Belgium; Mahmoud Sawaby, Stanford University; Farhana Sheikh, Intel; and Tom Van Bruessegem, IC-sense, Belgium
- **Moderator:** Chris Mangelsdorf, Analog Devices, California
- **Panelists:** Marco Berkhout, NXP Semiconductors, The Netherlands; Alison Burdett, Sensium Healthcare, United Kingdom; Alvin Loke, Taiwan Semiconductor Manufacturing Company, California; Kenichi Okada, Tokyo Institute of Technology, Japan; Drew Hall, University



The Smartest Designer in the Universe quiz show participants on stage.

of California, San Diego; and Filip Tavernier, KU Leuven, Belgium.

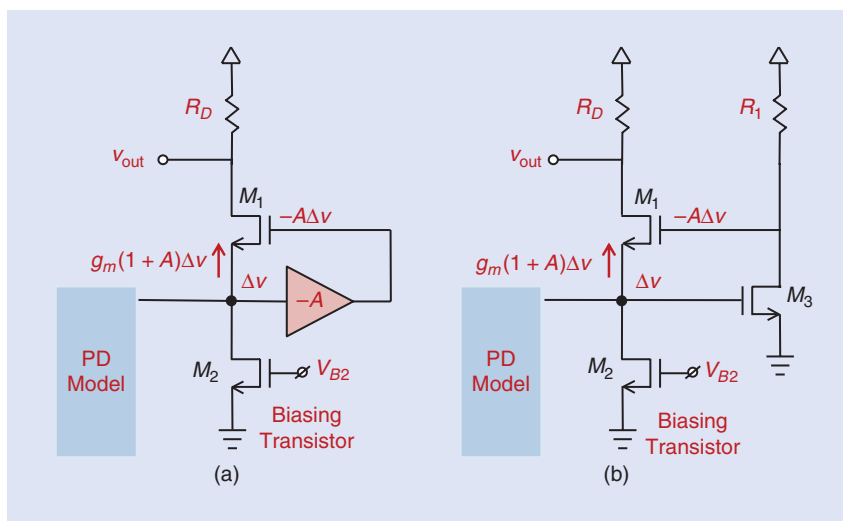
Good silicon engineering is like practicing sports on an Olympic scale. Be the best and be known being the best. But who is actually the smartest designer in the universe? Who is capable of combining endless creativity with superb knowledge and insight? And where will we find this person: in industry or in academia? Or will the students rise up and show the former generation their tail?

In this interactive quiz show hosted by the always entertaining Chris

Mangelsdorf, three teams representing industry, academia, and students competed for the honor and the prestigious title: “Smartest Designer in the Universe.” In several rounds, the contestants solved questions and puzzles covering all parts of electrical engineering. The audience was also able to participate and try to answer questions correctly using a mobile app. In the end, industry won the event, but students and academia vowed to come back in the future to get revenge!

—Denis Daly

## CIRCUIT INTUITIONS (continued from p. 13)



**FIGURE 5:** (a) A schematic of a regulated-cascode TIA using a voltage amplifier with negative gain. (b) A common-source amplifier is used to implement the voltage amplifier.

current being received from the PD. As an example, the root-mean-square noise current created by the TIA at

its input can be on the order of 4 nA. To have a low bit error rate, we must ensure that the input signal to the

TIA is much higher than this value for the receiver. We will discuss the noise considerations in more detail in a future article of this series.

In summary, a TIA is a two-port device that converts an input current in one port to an output voltage in another port. A TIA is expected to have a low input impedance, so as to absorb all the current produced by the PD, and a high output impedance, so as to have a high gain. We reviewed two TIA designs in this article, one using a simple common-gate amplifier and one using a regulated-cascode amplifier.

### References

- [1] A. Sheikholeslami, “Transfer resistor,” *IEEE Solid State Circuits Mag.*, vol. 11, no. 1, pp. 7–9, Winter 2019. doi: 10.1109/MSSC.2018.2881859.
- [2] A. Sheikholeslami, “Looking into a node,” *IEEE Solid State Circuits Mag.*, vol. 6, no. 2, pp. 8–10, Spring 2014. doi: 10.1109/MSSC.2014.2315062.

