



# SOLID-STATE CIRCUITS



IEEE Solid-State Circuits Society Quarterly Newsletter

## Japan Chapter Selected as First Recipient of New SSCS Outstanding Chapter Award

The Japan Chapter will receive the first SSCS Outstanding Chapter Award. This new SSCS award recognizes one Chapter each year that has consistently demonstrated outstanding leadership and initiative in its activities. The Award will be presented at ISSCC in February 2001.

Jan Van der Spiegel, the SSCS Chapters Coordinator, said of this well-deserved honor, "Japan has hosted a lot of unique activities.

They have coorganized three conferences, initiated a new student award, and had very strong membership growth. Their seminar on Wireless and Mobile Access was particularly successful." The seminar featured Professor Paul Grey of UC Berkeley, who spoke on "Recent progress in ICs for wireless communications," and Dr. Masahiro Morikura of NTT, whose talk was "System aspect and service concept of multimedia mobile access communications."

The Japan Chapter also organized a valuable review meeting of ISSCC 2000. The goal of this meeting was to help bring the essence of the conference to Society members who could not attend. The review meeting consisted of 12 selected papers from ISSCC and two lectures. The ISSCC Far East Committee Chairman, Dr. Youichi Unno, presented a conference overview along with some of the remarkable achievements and technology trends presented at the conference this year.

In addition to the ISSCC Review Meeting, the Japan Chapter cosponsored the Asia-Pacific Conference on ASIC (AP-ASIC), Seoul, Korea, in August 1999. This was the first conference to promote ASIC design research and development activities in the Asia-Pacific region. The Chapter also cosponsored the VDEC LSI Designers Forum in September 1999 and the 3rd System LSI Biwako Workshop in November 1999, which attracted more than 300 participants.

When asked what the key is to managing an effective Chapter, Hajime Ishikawa, Chair of the Japan Chapter, said, "Most important for



Hajime Ishikawa, Chair of the SSCS Japan Chapter, which was selected as the first recipient of the SSCS Outstanding Chapter Award.

us is to create and sustain interest and enthusiasm for VLSI circuits R&D activities. We look to serve the chapter members as well as to-be members, particularly young engineers and students. Our newborn Japan chapter provides unique meetings to deliver hot information of leading edge technologies presented in conferences that are held overseas. Attendees this spring rated very favorably the ISSCC 2000 Review Meeting. The new 'SSCS Japan Chapter Award' spotlights and encourages student research activities."

The Japan Chapter has a full slate of activities planned for the upcoming year. In August 2000, it is cohosting the ASIC 2000 meeting and the Summer School on VLSI Design. In the fall of 2000, it is cosponsoring the 2000 VDEC LSI Designers Forum and the 4th System LSI Biwako Work-

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shop. In 2001, the Chapter hopes to host an SSCS Distinguished Lecturer and to have another successful ISSCC 2001 Review Meeting.

Currently, the Japan Chapter serves eight sections and is preparing to organize another new chapter in Kansai. To view the activities of the Japan Chapter, go to its Web site: [http://homepage1.nifty.com/ieetokyo/soc/ssc37/ssc\\_e.htm](http://homepage1.nifty.com/ieetokyo/soc/ssc37/ssc_e.htm).

Congratulations to the Japan Chapter on an outstanding year!

Although this is only the first year of the SSCS Outstanding Chapter Award, the Chapters Committee had a large number of highly qualified and impressive candidates to choose from. The criteria to select an outstanding Chapter are based on the quality and quantity of activities sponsored by the Chapter, benefits

for Chapter members, successful outreach programs to the professional community, and growth of Chapter membership. Any member can nominate a Chapter; Chapter Chairs can nominate their own Chapters. Nominations close at the end of June each year. The Award consists of a check for \$1,000 to be used for Chapter activities and a Certificate of Recognition for the Chapter. ●

## Chapters Round-Up

### **Novosibirsk, Russia Student Chapter**

*Ilya L. Novikov, Chapter Chair*

The new Novosibirsk Student Branch has had an impressive first year. The chapter recently hosted two speakers. Professor I. G. Neizvestny presented the topic Microelectronics and Nanoelectronics: The Modern Way of Development. In this lecture, the technological aspects of micro- and nanoelectronics were considered. In another lecture, Professor V. A. Gridchin reviewed the Quantum Hall Effect. Both lectures were well attended and well received.

The Novosibirsk Student Branch has made it possible for young students to participate in conferences held throughout the region. For example, the chapter supplied technical and financial support to the 2nd IEEE-Russia Conference, 1999 High Power Microwave Electronics: Measurement, Identification, Application (MIA-ME'99).

Student members also participated in the 3rd Annual Korean-Russian Symposium (KORUS'99), and the VIth Russian Practical Scientific Conference of Students and Young Specialists. Other important activities of the Student Branch include participation in the Modern Technique and Technology Conference at Tomsk Polytechnical University and the 37th Annual Science Days-2000 student conference at the Novosibirsk State Technical University. This year, the Novosibirsk Student Branch has established two

awards for Best Paper to be presented to students at the annual Science Days-2000 conference.

In the upcoming year, the chapter hopes to establish an IEEE Student Research Center as a place of scientific exploration and creation. The Student Branch is also organizing English classes for student members in an effort to improve communication and writing skills. This program has been established in conjunction with the IEEE Language Laboratory.

### **New Toronto Chapter Formed**

*Raymond Chik, Chapter Chair*

In July, the new SSCS Chapter in Toronto was formed. Chapter Chair, Dr. Raymond Chik, took the initiative to form the new Chapter because he wanted to increase interaction among individuals interested in solid-state circuit design. Dr. Chik hopes to build a network of IEEE/SSCS members and to foster a link between industry and research.

Some activities that are planned for the Toronto Chapter include the establishment of a Web site that would provide information about Chapter activities and access to downloadable presentations. Dr. Chik would also like to connect employers with job seekers in the SSCS technical areas. To accomplish this, the Toronto Chapter plans to organize career-oriented talks with speakers from industry in the field of IC design; the desired outcome would be to inter-

est individuals in pursuing careers in solid-state circuits.

### **New West Ukraine Chapter Hosts Conference**

*Mykhaylo I. Andriychuk, Chapter Chair*

The SSCS recently endorsed the organization of the new joint MTT/EDS/AP/CPMT/SSCS West Ukraine Chapter. The goals of the new Chapter will be directed toward consolidating the scientific and engineering communities of the West Ukraine region. One main objective of the Chapter will be to recruit new IEEE members.

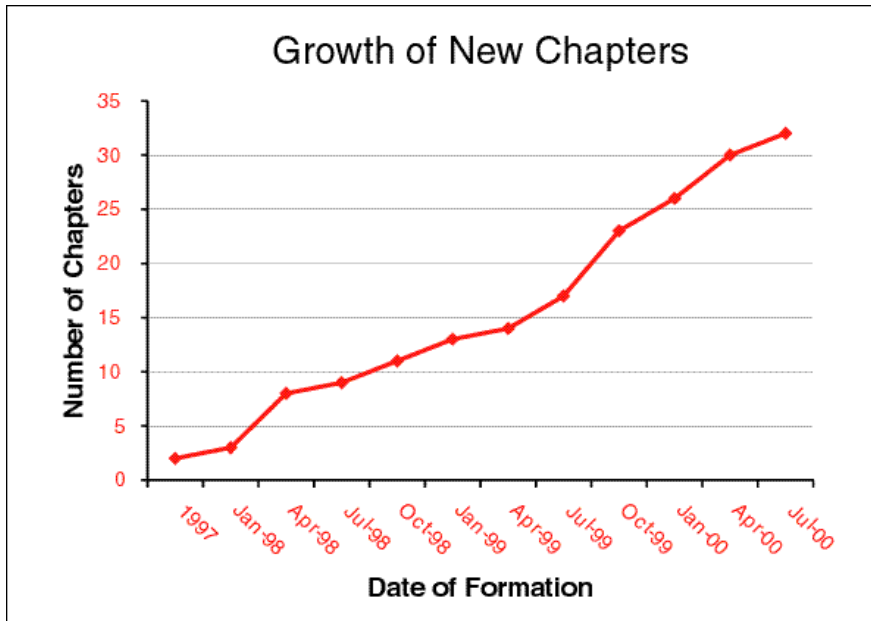
In the upcoming year, the Ukraine Chapter will cosponsor the VIth International Seminar on Direct and Inverse Problems of Electromagnetic and Acoustic Wave Theory (DIPED-2001). This seminar will be held at the Institute for Applied Problems of Mechanics and Mathematics of NASU in Lviv, Ukraine.

The Ukraine Chapter also hopes to provide support for the XVIth West Ukraine Regional Conference of Students and Young Scientists to be held at the Physico-Mechanical Institute of NASU in Lviv, Ukraine in May 2001.

### **Zurich Chapter Hosts Distinguished Lecturer**

*Q. Huang, Chapter Chair*

This year, the Zurich Chapter has hosted a number of expert speakers including SSCS Distinguished Lecturer Willy Sansen, who presented his work on CMOS at a June collo-



SSCS has become one of the fastest growing societies in the IEEE, with increased focus on formation of new chapters and the expansion of joint chapters. For information on forming an SSCS chapter in your section, select Chapters from the SSCS homepage, [www.ieee.org/sscs](http://www.ieee.org/sscs).

quium. In March, the Chapter sponsored a colloquium on Mixed Signal Integrated Circuits, presented by C. S. Vaucher of Philips Research Labs, Eindhoven.

### SSCS Scottish Chapter Meeting

*Jim Brown, Chapter Chair*

The second meeting of the SSCS in Scotland was held in May at the offices of Semtech's IC design center in Glasgow. This historical building was an unlikely backdrop for a talk on electronics. The high ornate ceilings and wall-to-wall wooden bookshelves created an impressive setting. Dr. Stewart Smith of SGS-Thomson (VVL) was the keynote speaker. His talk on Color Vision was accompanied by an extremely effective demonstration that was very well received. The talk detailed CMOS image sensors and DSP coprocessors; it is these processors that provide the technology for a variety of CMOS cameras from Web cameras to the "Barbie Camera."

Seven independent design centers, representing Scotland's growing design community, were present at this meeting. All 25 participants gave very positive feedback on the talks.

### Boston Chapter Collaborates with the IEEE Computer Society

*Bruce Hecht, Chapter Chair*

Now entering its second year, the Boston Chapter has hosted several outstanding and well-attended events in 2000, generally attracting about 50 people from a mixture of different backgrounds. Most of the attendees are from industry, but many have come from the local universities — graduate students and occasionally professors. Because the Boston Chapter hosts many events jointly with other chapters, this diversity has proven extremely beneficial for networking and sharing purposes.

In December 1999, Professor Jonathan Mills of Indiana University presented a lecture titled Electronic Biocomputers. In May 2000, Shalom Wertsberger, from Saltamar Innovations, spoke about Software Patents Worth Millions. Both of these events were held jointly with the Boston SSCS and the IEEE Computer Society. In March, Wayne Struble, M/A Computer Technology Fellow, presented a lecture entitled Active and Passive Modeling Challenges for +1GHz IC Design. This event was held jointly with the IEEE Microwave Theory and Techniques Chapter.

In the coming year, the Boston Chapter will build on their existing strengths. They hope to expand their program to include more frequent events, on a wider variety of circuits-related topics. They will continue to encourage joint Chapter meetings as well as interactions with student groups at area universities.

### Taipei Chapter Hosts Popular Short Courses

*Chorng-kuang Wang, Chapter Chair*

The Taipei Chapter has been very active this year, organizing Short Courses for the benefit of their members with speakers from the United States or Japan. In January, the Taipei Chapter cohosted a four-day short course on Modern VLSI Devices at the National Tsinghua University in Hsinchu. This course featured two talks by Dr. Yuar Tau and Dr. Tak Ning, both of IBM T. J. Watson Research Center, Yorktown Heights, NY. Both were invited by Prof. Ching Hsian Hsu of the university who once worked at IBM. The course was very well attended with over 190 participants (50 academic and 140 industry research).

This past spring, the Chapter hosted another three-day Short Course on Wireless and Broadband Communications at the National Chao Tung University, also in Hsinchu, attended by 274 participants (171 academic and 103 industry research). Presenters were Dr. Huang-Chang Liu of Broadcom Corporation, California, Dr. Samuel Shen of DataPath System Inc., California, and Manager Baba Matzushita, of Shiku-koku, Japan. CK Wang credits the success of these Short Courses to the good topics and good speakers but also very importantly to the involvement of the joint sponsoring organizations (MOE, NSC, and ITRI, and the campuses hosting the events).

The Taipei Chapter has also been involved in Student Membership activities, hosting three presentations on three different campuses. Dr. David Lin of VIA spoke on Mixed-Signal IC

*Continued on next page*

## Chapters Round-up *continued*

Design and Chorng-kuang Wang, who spoke on two occasions on two campuses on Constant Magnitude Control for Communication VLSI.

The Taipei Chapter also has a busy year ahead. They are cosponsoring the AP-ASIC 2001 in Korea and the AP-ASIC 2002 to be held in Taiwan.

### Seoul Chapter Hosts Distinguished Lecturer

*Moon K. Lee, Chapter Chair*

The Seoul Chapter has been very busy coordinating several educational activities for the benefit of their members. In July, the Seoul Chapter hosted SSCS Chapter Coordinator and Distinguished Lecturer Dr. Jan Van der Spiegel. Dr. Van der Spiegel presented his research on Biologically Inspired Vision Sensors at Hanyang University in Anan City and Yonsei University in Seoul. In June, the Chapter hosted a lecture Smart Power ICs: Power ICs in Telecommunications by Dr. Ayman Shibib of Lucent Technologies. Upcoming educational events include a lecture in October, Flat Panel Displays and Low Power Image and Communication Chip Technologies. In November, the chapter will host a seminar given by Dr. Hiroshi Iwai on Small Geometry CMOS, Low Power CMOS, and RF CMOS.

In May, the Seoul Chapter sponsored the Institute of Electronic Engineers of Korea CAD and VLSI

Conference. Several outstanding papers were presented at this conference, with six papers being selected to receive a cash prize and certificate awarded by the SSCS Seoul Chapter. The Seoul Chapter also cosponsored the IEEK Circuits and Systems Conference, which presented 42 technical papers in the area of solid-state circuit design.

The Seoul Chapter has also been very busy organizing the 2nd annual IEEE Asia-Pacific Conference on ASICs to be held at the Hotel Shilla, Cheju Island, Korea, 28-30 August. The conference will feature the presentation of 84 technical papers. The AP-ASIC conference is jointly sponsored by the IEEE/SSCS, IEEE Seoul Section, IEEE/SSCS Taipei Chapter, and the IEEE/SSCS Tokyo Chapter.

### Dallas Chapter Hosts Monthly Lectures

*Paul C. Yu, Chapter Chair*

*by Yin Hu, Dallas Chapter Secretary*  
In April, Dr. Gene Frantz of Texas Instruments addressed the system perspective of System On A Chip (SOC) technology. According to this perspective, the continued scaling of silicon technology beyond 0.25  $\mu\text{m}$  will provide the systems designer the possibility of creating complete systems on one integrated circuit. At the same time, this trend toward miniaturization and lower operating voltages permits an ever-increasing degree of functional integration with the potential of dramatic improvements in performance, cost, and power at the systems level. However, this drive to a single chip should be used to meet the goals of the system rather than to take advantage of the technology. Dr. Frantz's presentation dealt with the questions of why it should be done, when should it be done, and who should do it.

In May, Dr. Richard Hester of Texas Instruments spoke to the Chapter about Analog Front End Design for ADSL. Dr. Hester introduced the analog designer's view of ADSL and explained how system constraints drive the AFE architecture. The analog front end (AFE) in an ADSL modem is the key to modem performance. It is defined around constraints imposed by the ITU/ANSI standards bodies, the modem DSP algorithms, and the 2- to 4-wire hybrid. A design recently presented at CICC 2000 illustrated many points of the presentation.

### MIEL 2000 Conference Report

*Ninoslav Stojadinovic, Yugoslavia Chapter Chair*

The 22nd Annual International Conference on Microelectronics (MIEL 2000) was held in May at the Faculty of Electronic Engineering, University of Nis, Yugoslavia. A total of 13 keynote invited papers and 93 regular papers (44 in oral and 49 poster sessions) were presented. A total of 92 domestic and foreign participants representing 27 countries took part in the conference.

The topics covered by the technical program included important aspects of microelectronic devices and circuits. Some of the topics covered in the lectures included: Semiconductor Physics and Technology, Device Physics and Technology, Hybrid Technologies, Microsystems Technologies, Power Devices and ICs, Device Reliability and Characterization, and Circuit Design and Testing. This year, separate sessions were devoted to each of these seven topics in the MIEL 2000 program. In addition to these sessions, two Short Courses were held on the main conference topics of Power Devices and ICs and Microsystems Technologies.

Three Best Paper Awards were given based on paper quality and oral presentation. The award for Best Oral Paper was presented to A. Vujanovic of the Technical University of Vienna for the presentation,



Dr. Michael Ostling, Royal Institute of Technology, presented a seminar to 35 attendees on a polysilicon emitter SiGe BJT devices and technology for high speed circuit applications at Yonsei University, Seoul, Korea, in January, cosponsored by the ED/SSC Seoul Chapter and the ED Korea Chapter.



The May 2000 MIEL Conference that took place in Nis, Yugoslavia drew close to a hundred participants from 27 countries. The proceedings are available via [shop.ieee.org/store](http://shop.ieee.org/store); search for MIEL.

“Silicon microstructure for precise measurements of mechanical moments”; the Best Poster Award was presented to J. Nicolics of the Technical University of Vienna for the poster entitled, “Investigation of the thermal performance of micro-whisker structured silicon heatspreaders for power devices”; and the Best Student Paper award went to P. Igc of the University of Wales for “Investigation of the thermal stress field in a multilevel aluminum metallization in VLSI systems using finite element modeling approach.” The international scientific journal *Microelectronics Reliability* also presented an award for the paper, “Rise-time effects in ggnMOST under TPL stress” by G.

Boselli, T. Mouthan, and F. Kuper of the University of Twente, The Netherlands.

MEIL 2000 was organized by the IEEE Yugoslavia ED/SSC Chapter in cooperation with the Faculty of Electronic Engineering and Ei-Holding Company, Nis, and under the auspices of the Serbian Ministry of Science and Technology, Yugoslav Ministry of Science and Development, Yugoslav Ministry of International Cooperation, Yugoslav Academy of Engineering, and City Assembly of Nis. We are particularly thankful to the EDS/SSCS for its understanding and continuous support and to the IEEE Region 8 Conference Committee, which provided valuable support at critical moments. Two volumes of conference proceedings, totaling 766 pages, were published through the IEEE Book Broker Program.

**Historical Electronics Museum Collaboration of Baltimore Chapter**

*Anna Roesch, Chapter Chair*  
The Baltimore Chapter considers its most unique activity to be its inter-

action with the Historical Electronics Museum (HEM). The HEM is a small local museum founded in 1973 by one of the larger employers of SSCS and EDS members in the area, Westinghouse, now part of Northrop Grumman. The HEM objectives are to preserve and exhibit electronic artifacts with historical significance and to educate and encourage careers in science and engineering. The HEM has six exhibit galleries, including an educational gallery, archives and lending library, and meeting rooms. The exhibit gallery relevant to the SSCS and EDS was clearly outdated, so the Baltimore Chapter helped initiate some substantial improvements. The role of the Baltimore Chapter has evolved to include providing technical input with updates to existing exhibits, recommending new exhibits on current and future technology, requesting and organizing donations from Chapter members and their employers, and acting as a liaison to the IEEE for financial support.

The Baltimore Chapter and the HEM are currently working on the “Sand to System” display of microelectronics fabrication. Some ideas for future displays include “System On A Chip” and “MEMS.” You can visit the Web site at [users.erols.com/radarmus](http://users.erols.com/radarmus). ●

## Call for Nominations and Suggestions for the IEEE Solid-State Circuits Award and Other IEEE Technical Field Awards

Nominations and nominee suggestions are sought for recipients of the IEEE Solid-State Circuits Award and other IEEE Technical Field Awards (TFAs). The 22 IEEE TFAs are institute-wide and are awarded annually to recognize outstanding contributors to the art and science of electro- and information technologies. Deadline for submission of nominees for TFAs is 31 January of each year.

**The Solid-State Circuits Technical Field Award** is clearly the most relevant to SSCS members. It is awarded for outstanding contributions in the field of solid-state circuits to an individual or team of not more than three. The presentation includes a Bronze medal, certificate, and \$10,000.



Other TFAs in areas relevant to the SSCS include:

- The **Cledo Brunetti Award** for outstanding contributions in miniaturization in the electronic arts
- The **IEEE Masaru Ibuka Consumer Electronics Award** for outstanding contributions to the field of consumer electronics

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## Call for Nominations *continued*

- The **IEEE Morris N. Liebmann Memorial Award** for important contributions to emerging technologies recognized within recent years
- The **IEEE Frederik Philips Award** for outstanding accomplishments in the management of R&D resulting in effective innovation
- The **IEEE David Sarnoff Award** for outstanding contribution in electronics, with preference given to an individual for achievement in the past 10 years

It is perfectly acceptable to nominate an individual or team for more than one TFA for the same work (if the work falls within the scope of the respective TFAs). While the nominee(s) cannot receive more than one TFA for the same work, it does increase one's chances of winning. A complete list of IEEE Technical Field Awards is available on the IEEE Web site: [www.ieee.org/about/awards/tfalst.htm](http://www.ieee.org/about/awards/tfalst.htm). The SSCS Awards Committee welcomes suggestions for nominations for any or all of these awards. Any person may nominate a candidate for an IEEE medal or award; self-nomination, however, is not allowed. The SSCS Awards Committee will help in the nomination process and will undertake finding appropriate nominators if necessary; the Committee can be contacted through the Chair. ●



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## Workshop on RF Circuits for 2.5G and 3G Wireless Systems

**4 February 2001, San Francisco Marriott**

The SSCS is pleased to announce a full-day workshop on RF circuits for 2.5G and 3G Wireless Systems, sponsored by the SSCS Solid-State Circuits and Technology Committee. It will be held at the San Francisco Marriott, 4 February 2001, the day before ISSCC 2001.

The market demand for sending high-speed data over wireless has spawned several competing modulation standards for 2.5- and 3Generation systems. EDGE, IS-95B, 1XRTP, 3XRTP, WCDMA, and other standards have been proposed. All of these standards call for envelope-varying signals and will produce significant peak-to-average ratios. This will necessitate receiver and transmitter circuits that must operate with much higher linearity than used in 2G hardware. This workshop will describe the signal differences between the proposed and existing wireless standards and the requirements for the RF electronics that support them.

The format of the workshop is arranged to allow participants to discuss and interact: 40–45-minute talks, with an additional 10 minutes for discussion; coffee breaks; and a group lunch. There is no published digest, and to encourage a free flow of information, cameras and recording devices will not be allowed. Robert Bayruns of Tropian is organizing the workshop. Attendance will be limited—similar workshops in the past have filled up quickly. Information on talks and preregistration forms will be available online in mid-October at [www.ieee.org/ssctc](http://www.ieee.org/ssctc). Other information can be obtained from Suzanne Demarie, Courtesy Associates: Tel: +1 202 331 2000; Fax: +1 202 331 0111; Email: [SSCTC@courtesyassoc.com](mailto:SSCTC@courtesyassoc.com).



IEEE Solid State Circuits Society: Desktop Education

### ISSCC 2000 SHORT COURSE Circuits & Devices for RF Wireless Networks

Device Technologies for RF Wireless Networks  
John D. Cressler

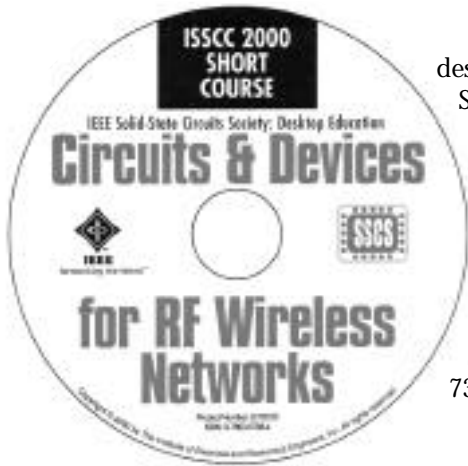
The Lowdown on Low Noise Amplifiers  
Allen Podell

Power Amplifier Device and Circuit Design  
for Next Generation Wireless Applications  
Barrie Gilbert

Fundamental Aspects of Modern Active Mixer  
Design  
Lawrence Larson

## ISSCC Short Course CD Available

The popular Short Course, *Circuits and Devices for RF Wireless Networks*, which was quickly filled with registrants prior to the ISSCC 2000, is now available on CD. The disk includes all the overheads that accompanied the presentations, the audio of the presentations, which can be heard with the Real Player™ version 7 provided on the disk, and 60 IEEE articles that the presenters cited. The Short Course is intended for engineers in the design and development of circuits and technologies for 2.4/5.6 GHz and above, and RF wireless networks. The course provides an overall perspective of competing silicon-based RFIC devices and a detailed description of possible circuit designs of key RF wireless transceiver building blocks. Topics covered include Si and SiGe device characteristics and tradeoffs in RF applications, low-noise amplifier characteristics, tradeoffs and



designs; fundamental objectives in mixer designs for RF transceivers and Si/SiGe solutions; and circuit and device designs for RF power amplifiers.

The CD-ROM is priced at \$190 for IEEE members and \$235 for non-members plus shipping. Order as #EC125 or ISBN 0-7803-6241-1: +1 800 678 IEEE (inside U.S. and Canada), +1 732 981 0060 (worldwide) Fax: +1 732 981 9667.

Course registrants who ordered the CD at the time of registration have been mailed their copies already. If any course registrants who prepaid for the CD have not yet received it, they should contact the SSCS Executive Office: c.macor@ieee.org, +1 731 981 3410 or fax to +1 731 981 3401. ●

## 2000 Custom Integrated Circuits Conference Review

Sunny Orlando, Florida was the site of this year's Custom Integrated Circuits Conference (CICC), held 21-24 May. Conference highlights included a quartet of educational sessions, 129 technical paper presentations organized into 21 sessions (this year, for the first time, all technical authors presented their papers in PowerPoint format), spirited panel discussions, as well as an exhibit hall packed with leading companies from the semiconductor industry. Citing such factors as technical content, keynote and luncheon speakers, and location and convention facilities, this year's attendees rated CICC 2000 as one of the best ever!

### Educational and Tutorial Sessions

The four educational sessions were: Current Issues in IC Design, System On A Chip, Broadband Communications, and Wireless IC Design. Each of the sessions contained four 2-hour tracks, providing attendees the opportunity to gain insight into new and/or emerging technologies or to brush up on existing skills.

Some of the key tutorials were an "Overview of circuit simulation techniques," "Design of high-speed D/A converters," "Design considerations for wireless SOCs," "Design issues and techniques for SOI circuits," "Modem fundamentals," "ADSL architecture," "RF system design," and "Phase-locked loops."

### Keynote Presentation

This year's keynote presentation was given by Joe Pumo, Director of SOC Design Technology Group, Motorola, and was entitled "SOC: The convergence point for solutions of the 21st century." His presentation focused on the challenge of delivering a complete solution that meets the customer's system requirements—function, performance, and price—in a competitive time-to-market.

Mr. Pumo discussed how SOC defines a product that is targeted for a specific application, which contains an entire system, including embedded software, as well as defining a process from developing the system specification through final product qualification (see

Figure 1). Mr. Pumo's complete slide presentation can be downloaded from the CICC Web site: [www.ieee-cicc.org/conference/keynote](http://www.ieee-cicc.org/conference/keynote).

### Luncheon Speaker

One of the most exciting presentations this year was given by Dr. Rudolf Danner of NASA's Jet Propulsion Laboratory. His talk, entitled "Of hummingbirds and undiscovered worlds: Optical interferometry and NASA's quest for habitable planets," discussed how NASA plans to use optical interferometry to find and characterize Earth-size planets orbiting stars other than our own Sun. Using this technique, scientists can determine if a planet contains the basic ingre-

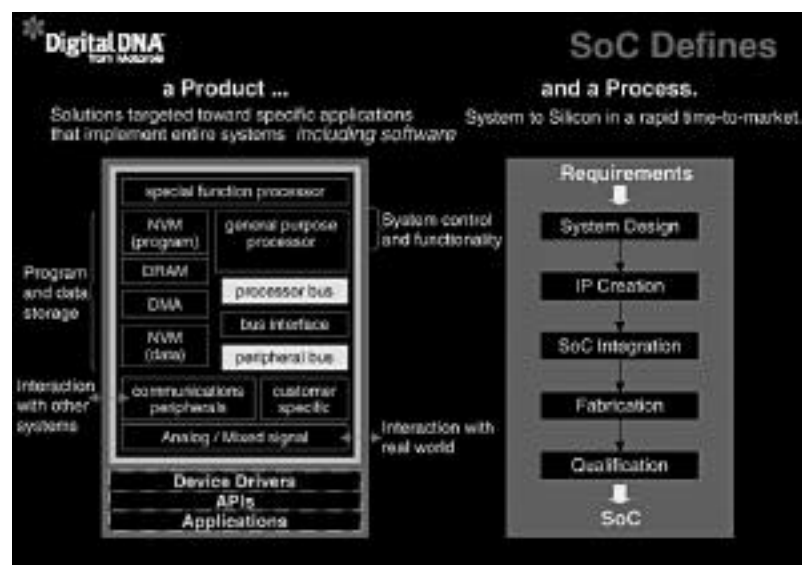


Figure 1: Joe Pumo's keynote presentation on "SOC: The convergence point for solutions of the 21st century" is available online at [www.ieee-cicc.org/conference/keynote](http://www.ieee-cicc.org/conference/keynote).

dients that they believe to be essential to support life, that is, (1) surrounded by an atmosphere at room temperature containing ozone and nitrogen and (2) evidence of liquid surface water. Dr. Danner's complete slide presentation can be downloaded from the CICC Web site: [www.ieee-cicc.org/2000/conference/events/luncheon.html](http://www.ieee-cicc.org/2000/conference/events/luncheon.html).

### Technical Program

Historically, the CICC technical program has focused on nearly all aspects of integrated circuits, from fabrication to complete functional systems. This year was no exception, with sessions on process technology, test and reliability, custom and low-power circuits, embedded memory, analog design, wired and wireless communications, digital signal processing, programmable devices, Systems On A Chip (SOC) design and design methodologies. Nearly 300 technical papers were submitted, from which the program's 129 were selected. Several of the most noteworthy are discussed below.

"CMOS in the new millennium," an invited paper from T. Ning of IBM, addressed the challenges faced by CMOS technology as it approaches its ultimate scaling limits. The paper theorizes a limit of 25 nm for channel length, a gate oxide thickness of 1.5 nm, and a power supply voltage of 1 V, and then articulates the challenges of fabricating such a technology. Along the same lines of technology scaling, another invited paper, "Effects of technology scaling on digital CMOS logic styles," from M. W. Allam et al. of the University of Waterloo, Ontario, discusses the behavior of various logic circuit families for future technology generations, while predicting the effects of scaling on performance, hot carriers, leakage currents, and interconnects. In his paper, "A new design for complete on-chip ESD protection," A. Z. Wang of the Illinois Institute of Technology discusses a novel way

of protecting against electrostatic discharge. His approach is compact, provides protection in all directions, is ultrafast with programmable threshold voltages, and its small size reduces parasitic effects, making it ideal for RF applications.

A high-resolution, low-voltage delta-sigma modulator analog-to-digital converter was presented by R. Naiknaware et al. of Washington State University, Pullman, in the paper entitled "142 dB ADC with a 100nV LSB in a 3V CMOS process." It achieves 142 dB dynamic range in a 100 Hz bandwidth and 132 dB dynamic range in a 1000 Hz bandwidth, while achieving roughly the same noise power density as a 1 k resistor. The converter, suitable for high-performance instrumentation applications, uses correlated double sampling to reduce flicker noise contributions as well as a number of power optimization techniques enabling a total power dissipation of 22.8 mW from a 3 V supply. Another key analog paper, "A 2.5Gb/s clock recovery circuit for NRZ data in 0.4 $\mu$  technology," by S. Butala and B. Razavi of UCLA, described a 2.5 Gb/s phase-locked clock recovery circuit utilizing a two-stage ring oscillator and sample-and-hold phase detector. To guarantee oscillations, each of the two stages has a load made of a transistor and an RC network that provides excess phase shift. Experimental results of the circuit presented show a recovered clock that has a RMS jitter of 10.8 ps.

In wireless designs, one of the critical steps in the drive for higher integration and lower system cost is the integration of traditionally external components. In the paper from F. Huang and Kenneth O of the University of Florida, Gainesville, "A 900MHz T/R switch with a 0.8dB insertion loss implemented in a 0.5 $\mu$  CMOS process," a novel single-pole double-throw CMOS T/R switch for 3 V applica-

tions is proposed. The 0.8 dB insertion loss is achieved by optimizing the transistor widths and bias points and by minimizing the substrate resistance. The input and output nodes are DC biased to achieve a high 1 dB compression point. A key issue for a T/R switch is withstanding the potentially large RF input voltage in combination with an output impedance mismatch. The worst case of an open load (total reflection of the input signal) is used to calculate the maximum power the switch can deliver while avoiding gate oxide breakdown. The CMOS oxide breakdown limits the maximum transmit power of this switch to 10 dBm into a 50 load. Although the insertion loss of this switch is higher than discrete solutions used in today's cellular phones are, it could provide a cost-effective solution for ISM-band applications through integration with other CMOS components.

In the Embedded Memory session, a paper by P. Diodato et al. of Lucent, "Embedded DRAM: An element and circuit evaluation," demonstrates the use of an advanced capacitor dielectric, Tantalum Pentoxide, in a novel embedded DRAM cell structure. This cell structure uses the Metal 1/Metal 2 Tungsten via as the bottom plate of the capacitor and Metal 2 as the top plate, forming what Lucent calls a MOM (Metal-Oxide-Metal) DRAM cell.

"A full accuracy MPEG1 Audio Layer 3 (MP3) decoder with internal data converters," by S. Hong et al. of Dongguk University, Seoul, Korea, describes a complete implementation of a full-accuracy MPEG1 Audio Layer-3 (MP3) decoder having on-chip ADC and DAC circuitry. A recycling-type ADC with sample-and-hold that greatly reduces power consumption was employed. A novel 32-bit floating-point DSP core was used, along with an efficient power management technique.

Finally, in the area of System On A Chip, the paper "Wire planning for

performance and yield enhancement," by C. Ouyang et al. of Level One Communications, proposes a wire planning strategy at the layout stage that addresses the deep sub-micron issues facing both design and manufacturing engineers. In design, wire density affects system performance, while in manufacturing, wire density affects yield. From his experiment, the author has calculated the "sweet spot" for metal pitch, which results in optimal performance and yield. His conclusion points to the importance of wire planning and the unfinished business of incorporating such planning into commercially available placement and routing tools. In their paper entitled "Secure contactless smartcard ASIC with DPA protection," P. Rakers et al. of Motorola describe an SOC composed

of RF circuits, receivers, bandgaps, embedded EEPROM, 8-bit microcontroller, and a noise isolation circuit realized in a 0.6  $\mu\text{m}$  CMOS process. The result is a single-chip solution for contactless smartcard applications with a 2000 times reduction in digital signature amplitude to greatly increase security against DPA attacks. In addition to electrical and system-level-design problems, data security and encryption issues are covered. Finally, the IC operates without direct electrical or power connection, and I/O signals and power supply are obtained through RF connections.

### IEEE Journal to Have Special Issue on CICC 2000

The *IEEE Journal of Solid State Circuits* will devote its March 2001 issue to selected papers from CICC

2000. In addition, the full conference proceedings for CICC 2000 is available from the IEEE, +1 800 678 4333 (in U.S. and Canada), and +1 732 981 0060 (worldwide), catalog number CH37044-TBR. Visit the CICC Web site at: [www.ieee-cicc.org/](http://www.ieee-cicc.org/). Better yet, plan to attend CICC 2001 in San Diego, 6-9 May 2001! ●



**Jeffery H. Oppold**  
CICC 2000  
Technical Program  
Chair

joppold@us.ibm.com

## News for SSCS Members

It's that time of year to begin to fill out your IEEE renewal forms. Be sure not to let it slip by, otherwise you may see a lapse in your member benefits, including your subscription to the *Journal of Solid-State Circuits*.

By now you should have received ballots for SSCS AdCom elections; please be sure to fill them out and return them. It's an important duty for all Society members to participate in the selection of future Society leaders.

The Senior membership promotion is still going on. Build up your own resume and standing in our industry by seeking Senior level membership. It's easier than in the past; Senior Member forms and three references can be emailed or completed online: [senior-member-forms@ieee.org](mailto:senior-member-forms@ieee.org); URL: [www.ieee.org/organizations/rab/md/smforms.htm](http://www.ieee.org/organizations/rab/md/smforms.htm).

*Continued on next page*

**Editor's correction:** The citation for the Class of 2000 Fellow, Michel J. Declercq of Swiss Federal Institute of Technology, Lausanne, Switzerland was incorrectly stated in the July issue. Declercq has been recognized

*For contributions to innovative design of mixed signal integrated circuits.*

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For detailed contact information, see the Society  
Web page: [www.sscs.org/info/](http://www.sscs.org/info/)

For questions regarding Society business, contact the SSCS Executive Office.

Contributions for the January issue of the newsletter must be received by 3 Nov. at the SSCS Executive Office.

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## News for SSCS Members *continued*

# Congratulations!

### Congratulations to these new Senior Members

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**Steve Kosonocky**  
*Membership Chair*

IEEE Solid-State  
Circuits Society  
stevekos@  
us.ibm.com

## Jafar Savoj of UCLA Receives the 2000–2001 SSCS Predoctoral Fellowship

Jafar Savoj, a doctoral candidate at UCLA, has been selected to receive the IEEE Solid-State Circuits Society Predoctoral Fellowship for 2000–2001. “The Awards Committee had an exceptional field of candidates, and the choice was extremely difficult,” reports the Awards Chair, Richard Jaeger. “Mr. Savoj is to be commended for being selected for this prestigious award.”

Jafar Savoj (SM'98) was born in Tehran, Iran, in 1974. He received the B.S.E.E. degree from Sharif University of Technology, Tehran, Iran, in 1996, and the M.S.E.E. degree from the University of California, Los Angeles, in 1998, where he is now working toward the Ph.D. degree.

He spent the summer of 1998 with Integrated Sensor Solutions, San Jose,

CA, working on the design of high-precision interfaces for sensor applications. During the summer of 1999, he was with NewPort Communications, Irvine, CA, developing CMOS clock and data recovery circuits for the SONET OC-192 standard.



Mr. Savoj is performing his research under the supervision of Prof. Behzad Razavi. His Ph.D. work focuses on the design of fiber optic receivers in CMOS technology, specifically for SONET OC-192,

with emphasis on clock and data recovery circuits. His interests include high-speed, low-power circuit techniques, phase-locked loops, and clock and data recovery circuits. His contributions have appeared at ISSCC, the VLSI Symposium on Circuits, and in *Nikkei Microelectronics*. ●

## Workshop on Low Voltage and Low Power Mixed-Signal Circuits and Systems

The IEEE 2nd Dallas CAS Workshop on Low Voltage and Low Power Mixed-Signal Circuits & Systems is scheduled for Monday, 26th March 2001, Dallas, Texas. Conducted under the aegis of the IEEE Dallas Section, Circuits & Systems Society, the workshop will include invited lectures and poster sessions. Leading experts Dr. John Choma, Dr. Randall Geiger, Dr. Franco Maloberti, and Dr. Jaime Ramirez-Angulo will present the latest techniques and challenges involved in low power RF design, low voltage analog circuits, low voltage sigma-delta and Nyquist rate data converters. Prospective authors are invited to submit a one-page summary of their posters reporting original work in the area of low voltage/low power mixed-signal design. The deadline for submission of papers is October 16, 2000. For further information visit: [ewh.ieee.org/cas/dallas/wks2](http://ewh.ieee.org/cas/dallas/wks2)



General Chair:  
Dr. Gabriele Manganaro  
[gabriele.manganaro@ieee.org](mailto:gabriele.manganaro@ieee.org)

Technical Chair:  
Dr. Joseph Varrientos  
[joseph.varrientos@dalsemi.com](mailto:joseph.varrientos@dalsemi.com)

Registration Chair:  
Dr. Oscar Moreira-Tamayo  
[omoreira@ti.com](mailto:omoreira@ti.com)

## Thanks for JSSC Digital Archive

I just received the *JSSC* collection on DVD-ROM. I want to congratulate you and the SSCS for this effort! As a member since 1990, I have quite a pile of *JSSC* issues that occupies a significant space in my home. And being a frequent reader of the *Journal*, it is not uncommon for me to make a trip to the University Library, some 20 miles away, to be able to access the issues that I don't have. Thanks to your effort to put it all in DVD-ROM format; all I have to do is put it in my laptop and I can access ALL *JSSC* articles anywhere I am in the world! This is really great! I just wish that other IEEE societies would follow your example.

Thanks very much for an awesome work that has substantially improved my life and that of many other engineers.

**Ricardo Telichevesky**  
*Analog and Mixed-Signal  
Simulation Architect  
Cadence Design Systems, Inc.*

Search for JSSC on [shop.ieee.org/store](http://shop.ieee.org/store)

## Events Calendar *continued from page 12*

Also posted on [www.sscs.org/meetings](http://www.sscs.org/meetings)

### Technically Cosponsored Meetings

#### GAASIC

##### Gallium Arsenide Integrated Circuits Symposium

[www.gaasic.org](http://www.gaasic.org)

5–8 November 2000

Westin Hotel, Seattle, WA

Paper Deadline: passed

Contact: James J. Komiak  
Sanders, A Lockheed Martin Co.  
Nashua, NH

Email: [james.j.komiak@lmco.com](mailto:james.j.komiak@lmco.com)

#### 2001 VLSI-TSA

##### International Symposium on VLSI Technology, Systems, and Applications

[www.erso.itri.org.tw/VLSI-TSA/](http://www.erso.itri.org.tw/VLSI-TSA/)

18–20 April 2001

Taipei, Taiwan, R.O.C.

Paper Deadline: 20 October 2000

Contact: Ran-Hong Yan  
Lucent Technologies  
Holmdel, NJ

Tel: +1 732 949 7695

Email: [rhy@lucent.com](mailto:rhy@lucent.com)

#### ESSCIRC 2001

##### European Solid-State Circuits Conference

[www.eescirc.org](http://www.eescirc.org)

18 – 20 September 2001

Villach, Austria

Paper deadline: 6 April 2001

Contact: Herbert Grünbacher  
Carinthia Tech Institute  
Richard-Wagner-Strasse 19  
A-9500 Villach, Austria

Tel: +43 4242 2004 123

Fax: +43 4242 2004 179

Email: [hg@cti.ac.at](mailto:hg@cti.ac.at)

#### BCTM: IEEE Bipolar/BiCMOS Circuits and Technology Meeting

[ectm.et.tudelft.nl/www/BCTM/](http://ectm.et.tudelft.nl/www/BCTM/)

Short Course: 30 September 2001

Conference: 1–2 October 2001

Minneapolis Marriott City Center,  
Minneapolis, MN

Receipt of abstract and summary deadline:  
16 March 2001

Contact: Janice Jopke  
CCS Associates  
Eden Prairie, MN

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Fax: +1 612 934 6741

Email: [jopke@aol.com](mailto:jopke@aol.com)

## Call for IEEE Fellow Nominations

What do Paul Gray, Mark Horowitz, Toshiaki Masuhara, Rudy van de Plassche, Ian Young, and Nicky Lu have in common? They are but a few of the many SSCS members that have been elected to the grade of IEEE Fellow through the nomination and support of SSCS members.

The grade of IEEE Fellow is in recognition of exceptional accomplishment and is conferred by the IEEE Board of Directors on members who have significantly contributed to their technical field. Unfortunately, in recent years, the number of nominations for IEEE Fellow evaluated by the Society has dropped below that for other IEEE societies of comparable size. As a Society, we simply are not doing an adequate job of recognizing the very significant contributions our members have made to our profession. It is very important that we reverse this trend.

The Fellow nomination process is relatively straightforward but does require some forethought and planning. The deadline for receipt of the nomination form and reference letters is 15 March 2001. The nominator does not have to be an IEEE Fellow or even an IEEE member; self-nomination, however, is not allowed. The five (minimum) to eight (maximum) references must be from current IEEE Fellows, who are listed alphabetically at the beginning of the IEEE Membership Directory. If the nominee is not an IEEE Senior Member, that application and its three supporting references must be submitted no later than 4 February 2001. Senior Member forms and references can be emailed or completed online: [Senior-member-forms@ieee.org](mailto:Senior-member-forms@ieee.org); URL: [www.ieee.org/organizations/ab/md/smforms.htm](http://www.ieee.org/organizations/ab/md/smforms.htm).

The Fellow nomination form is four pages long. It is not difficult to complete and should clearly focus on the technical achievements for which the candidate is being nominated. It is usually completed in collaboration with the nominee.

Fellow kits will be available in November. They can be requested in hard copy format or downloaded from the Web: Fax: +1 732 981 9019; Email: [fellow-kit@ieee.org](mailto:fellow-kit@ieee.org); URL: [www.ieee.org/about/awards/table1.htm](http://www.ieee.org/about/awards/table1.htm).

The Society welcomes suggestions of members who should be nominated for Fellow.

# SSCS EVENTS CALENDAR

Also posted on [www.sscs.org/meetings](http://www.sscs.org/meetings)

## 2000 Biomedical Electronics SSCTC Workshop

[www.sscs.org/ssctw/oct00.htm](http://www.sscs.org/ssctw/oct00.htm)

12-13 October 2000

Key Bridge Marriott, Arlington, VA

Contact: Suzanne Demarie  
Courtesy Associates  
Washington, DC

Tel: +1 202 331 2000

Fax: +1 202 331 0111

Email: [SSCTC@courtesyassoc.com](mailto:SSCTC@courtesyassoc.com)

## 2001 ISSCC

### International Solid-State Circuits Conference

[www.isscc.org](http://www.isscc.org)

5-7 February 2001

San Francisco Marriott Hotel, San Francisco, CA

Paper submission deadline: 8 September 2000

(See new electronic submission requirements on the Web site)

Contact: Diane Suiters  
Courtesy Associates  
Washington, DC

Tel: +1 202 331 2000

Fax: +1 202 331 0111

Email: [ISSCC@courtesyassoc.com](mailto:ISSCC@courtesyassoc.com)

## 2001 CICC Custom Integrated Circuit Conference

[www.his.com/~cicc/](http://www.his.com/~cicc/)

6-9 May 2001

San Diego, CA

Paper deadline: 29 November 2000

Contact: Ms. Melissa Widerkehr  
Widerkehr & Associates  
Gaithersburg, MD

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Fax: +1 301 527 0994

Email: [cicc@his.com](mailto:cicc@his.com)

## 2001 Symposium on VLSI Circuits

[www.bcasj.or.jp/vlsi\\_sym/](http://www.bcasj.or.jp/vlsi_sym/)

14-16 June 2001

Rihga Royal Hotel, Kyoto, Japan

Deadline for receipt of summaries: 10 January 2001

Contact: Ms. Melissa Widerkehr  
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Societies Japan, Conference Dept.  
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