IEEE Circuits and Systems Society Newsletter

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# CHAOS: CONTROL AND ANTI-CONTROL

*by Guanrong Chen*

***Abstract:*** *Chaos control and anti-control technologies promise to have a major impact on many novel, time- and energy-critical applications, such as high-performance circuits and devices (e.g., delta-sigma modulators and power converters), liquid mixing, chemical reactions, biological systems (e.g., in the human brain, heart, and perceptual processes), crisis management (e.g., in power electronics), secure information processing, and critical decision-making in political, economic and military events. This new and challenging research and development area has become a scientific interdiscipline, involving systems and control engineers, theoretical and experimental physicists, applied mathematicians, physiologists, and above all, circuits and devices specialists. Both control and anti-control of chaos can be analyzed using chaos and bifurcation theories, and can be implemented by suitable design of control and switching circuitries.*

Chaos refers to one type of complex dynamical behaviors that possess some very special features such as being extremely sensitive to tiny variations of initial conditions, having bounded trajectories in the phase space but with a positive maximum Lyapunov exponent, possessing a finite Kolmogorov-Sinai entropy, a continuous power spectrum, and/or a fractional topological dimension, etc. Oftentimes, chaos coexists with some other complex dynamical phenomena like bifurcations, fractals, and strange attractors. A typical chaotic attractor generated by a power system model is shown in Figure 1.

Due to its intrinsic dynamical complexity, chaos was once believed to be neither controllable nor predictable, and, therefore, use-

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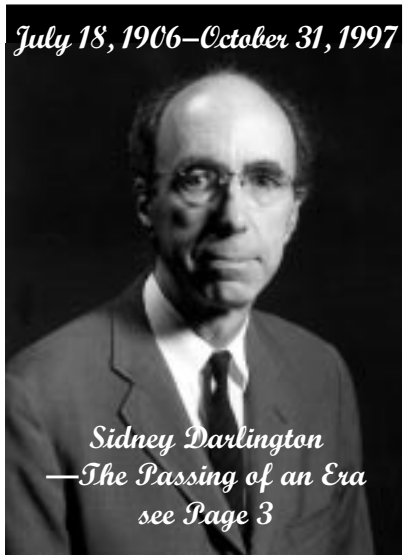


## SOME THOUGHTS ON INTRODUCING TODAY'S STUDENTS TO ELECTRICAL ENGINEERING

*By Yannis Tsividis*

This short article stresses several pressing problems with the classical way of introducing students to Electrical Engineering (EE). It also discusses ways to solve those problems, before it is too late. The article is a revised version of a white paper prepared by the author for IEEE CAS officers [1], and has been influenced by the views of several colleagues [2–4]. The writing below is direct and informal, in order to make several points stand out quickly:

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THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

# IEEE Circuits and Systems Society Newsletter

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***Darlington Special Issue, page 12***

# From Integrated Circuits (I-C's) to Integrated Circuits and Systems (I-CAS's): A Continued Vision into the Future

*As we honor the memory of one of the pioneering giants of the Society, in the person of Sidney Darlington, it is fitting that I…provide you with a perspective of how the Society may continue to lead …into the next century.*

***by Rui J. P. de Figueiredo***
***Society President***

As we honor, in this Newsletter, the memory of one of the pioneering giants of the Society, in the person of Sidney Darlington, it is fitting that I take a few moments of your time to provide you with a perspective of how the Society may continue to lead in the development of rapidly evolving circuits-and-systems-related technologies and applications into the next century.

This perspective began to unfold last year with the much acclaimed message from my predecessor, John Choma, entitled "Vision, Goals, and Tasks", published in the March 1997 issue of this Newsletter. John's vision placed a great emphasis on undergraduate, graduate, and continuing (short-course) education in circuits and systems. His ideas were further elaborated in the November 1997 Report of the 1997 President's Advisory Council (PAC–97), a summary of which appears in this issue.

This year, I propose to follow up the above developments by continuing to extend John's vision and implementing a plan of action, along the lines indicated respectively in the following two sections. In writing these sections, my beliefs have been tempered by the ideas expressed by the leadership of the Society (ExCom, BOG, and PAC) in replies to the questionnaires that I circulated to them soon after I assumed the presidency. I thank them for their suggestions, and I count on their unfailing support and yours to make our joint enterprise a real success this year.

**Continued Vision into the Future**

I find that the simplest way of continuing to define the Society's vision into the future is in terms of a few fundamental principles which may serve as the basis for the Society's activities. They are:


Rui J.P. de Figueiredo

**Principle 1 (Relevancy):** The center of the Society's activities ought to continue to shift, as rapidly and as well as possible, from its traditional *discipline-oriented* (D-O) approach toward a multi-disciplinary *applications-driven* (A-D) approach.

**Remark:** The *discipline-oriented* approach rooted in the pioneering contributions of R. E. A. C. Paley and N. Wiener, O. Brune, H. Bode, S. Darlington and others, which enabled the Circuits and Systems Society activities output to reach such great heights of excellence in circuit analysis and design can no longer, alone, sustain the design and implementation of the very complex objects that are the circuits and systems of today. Today's rapidly evolving complex market-driven applications, such as wireless, internet, and multimedia, require that wisdom, knowledge, and skills should also importantly flow from applications, best understood by industry, to the multiple disciplines or technologies that are needed to support them, best understood by

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## IN MEMORIAM
## Sidney Darlington
### July 18, 1906–October 31, 1997

***by Ernest S. Kuh and Irwin W. Sandberg***

Sidney Darlington, one of the world's most creative and influential circuit theorists, died at his home in Exeter, New Hampshire, on October 31 at the age of 91. He was a man of uncommon depth and breath whose first love was circuit theory. He made important widely-known contributions in several areas including network synthesis, radar systems, rocket guidance, and transistor networks.

Sid was born in Pittsburgh, Pennsylvania. He received the B.S. degree in physics (magna cum laude) from Harvard College in 1926, the B.S. degree in electrical communication from MIT in 1929, and the Ph.D. degree in physics from Columbia University in 1940. In 1929 he became a member of the technical staff at Bell Laboratories where he remained until he retired, as head of the Circuits and Control Department, at the then mandatory retirement age of 65. He was a member of both the National Academy of Engineering and the National Academy of Science. In 1945 he was awarded the Presidential Medal of Freedom, the United States' highest civilian honor, for his contributions during World War II. The award was established in that year by President Truman to reward notable service during the war. He received the IEEE Edison Medal in 1975 and the IEEE Medal of Honor in 1981.

In Darlington's early days at Bell Laboratories there was much interest in electrical filter theory, mainly in connection with the exacting needs of systems using frequency-division multiplexing. Then filter theory was very different than it is

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*Chaos Article. . . continued from front cover*

less. However, recent research advances have demonstrated that chaos not only is (long-term) controllable and (short-term) predictable, but also can be beneficial to many real-world applications. In fact, control and anti-control of chaos have become a rallying point for an important segment overlapping engineering, physics, mathematics, and biomedical science.

Chaos control refers to the situation where chaotic dynamics is weakened or eliminated by appropriate controls, while anti-control of chaos means that chaos is created, maintained, or enhanced when it is healthy and useful. Both control and anti-control of chaos can be accomplished via some conventional and nonconventional methods such as microscopic parameter perturbation, bifurcation monitoring, entropy reduction, state pinning, phase delay, and various feedback and adaptive controls [1].

There are many practical reasons for controlling or ordering chaos. First of all, chaotic (messy, irregular, or disordered) system response with little meaningful information content is unlikely to be of use as chaos can lead systems to harmful or even catastrophic situations. In these troublesome cases, chaos should be reduced as much as possible, or totally suppressed. For instance, stabilizing chaos can avoid fatal voltage collapse in power networks and deadly heart arrhythmias, can guide disordered circuit arrays (e.g., multi-coupled oscillators and cellular neural networks) to reach a certain level of desirable pattern formation, can regulate dynamical responses of mechanical and electronic devices (e.g., diodes, laser machines, and machine tools), can help well-organize an otherwise mismanaged multi-agency corporation to reach a stable equilibrium state whereby achieving optimal agent performance, etc.

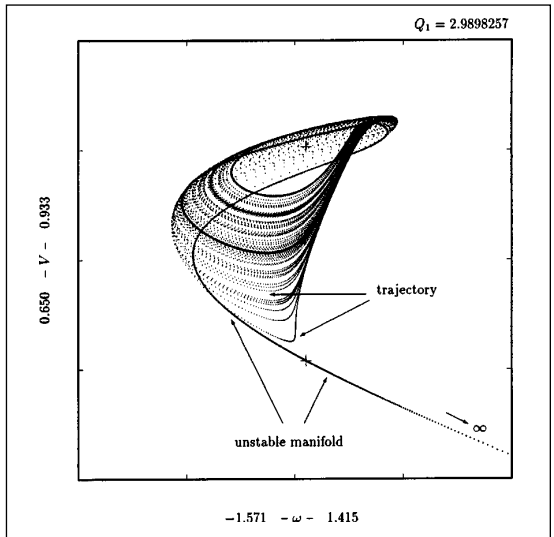


*Figure 1. The chaotic strange attractor of a power system model.*

Ironically, recent research has shown that chaos can actually be useful under certain circumstances, and there is growing interest in utilizing the very nature of chaos, particularly in some novel time- and/or energy-critical applications. The most motivative reason is the observation that chaos permits a system to explore its every dynamical possibility: when chaos is under control, it provides the designer with an exciting variety of properties, richness of flexibility, and a cornucopia of opportunities. Figure 2 visualizes how by varying a constant feedback control gain within a simple quadratic map, period-doubling bifurcation and chaos can be created and then be stabilized to a variety of equilibria of different periods. Traditional engineering design always tries to reduce irregular dynamical behaviors of a system and, therefore, completely eliminates chaos. However, such overdesign is usually accomplished at the price of losing great flexibilities in achieving high performance near the stability boundaries, or at the expense of radically modifying the original system dynamics. In many occasions, this proves to be unnecessary.

It has been shown that the sensitivity of chaotic systems to small perturbations can be used to direct system trajectories to a desired target quickly with very low and ideally minimum control energy. This can be crucial for navigation in the multi-planetary space system. A suitable modification of chaotic dynamics such as stability conversion or bifurcation delay not only can significantly extend the operational range of machine tools and jet engines, but also may enhance the artificial intelligence of neural networks, as well as increase coding/decoding efficiency in signal and image communications. Other application examples of chaos control and anti-control technologies include designing high-performance circuits and devices (e.g., delta-sigma modulators, automatic gain control loops, and power converters), achieving chaos synchronization for information processing, pattern recognition, and secure communications, forming various wave patterns and self-organized behaviors in oscillator arrays and neural networks, delaying bifurcations in electric power systems and energy convection loops, and performing crisis management and critical decision-making in political and economic, as well as military events.

Fluid mixing is another good example in which chaos is not only useful but actually very desirable, where two fluids are to be thoroughly mixed while the required energy is minimized. For this purpose, it turns out to be much easier if the dynamics of the particle motion of the two fluids are strongly chaotic, because it is otherwise difficult to obtain rigorous mixing properties due to the possibility of invariant two-tori in the flow. This has been one of the main subjects in fluid mixing, known as chaotic advection. Chaotic mixing is also momentous in applications involving heating, such as in plasma heating for a nuclear fusion reactor. In this process, heat waves are injected into the reactor, for which the best result is obtained when the heat convection inside the reactor is chaotic.

Within the context of biological systems, controlled biological chaos appears to be important to the way a human brain executes its tasks. There have been some suggestions that the human brain can process massive information instantly, in which case the ability of human beings in controlling brain chaos could be a fundamental reason. The idea of anti-control of chaos has been proposed for solving the problem of driving responses of a human brain model away from the saddle-type of equilibrium, so that undesirable periodic behaviors of

neuronal population bursting can be prevented. Also, some recent laboratory studies reveal that the complex variability of healthy dynamics in a variety of physiological systems has features reminiscent of chaos. For example, in the human heart, the amount of intracellular Ca2+ is closely regulated by a coupled process in a way similar to a system of coupled oscillators. Medical evidence reveals that controlling the chaotic arrhythmia in an appropriate way can be a new, safe, and auspicious approach to the design of a smart pacemaker for regulating heartbeats. Figure 3 shows a self-tuned delayed-feedback control simulation of a chaotic human-heart model to a period-three equilibrium state.

Motivated by many such potential real-world applications, current research on control and anti-control of chaos has become intensive. In the theoretical aspect, chaos control and anti-control are posing a new challenge to both system analysts and control engineers. This is due to the extreme complexity and sensitivity of chaotic dynamics, which can cause many unusual difficulties in long-term predictability and short-term controllability of chaos. A controlled chaotic system is inherently nonautonomous, and cannot be converted to an autonomous system in most cases since the controller as a time function is yet to be designed. Possible time-delay, noise, and coupling effects often make a controlled chaotic system Lyapunov-irregular and topologically extremely complex. As a result, many existing theories and methodologies for autonomous systems are no longer applicable. On the other hand, at the technical level, chaos control and anti-control have also posed new challenges to circuit designers and instrument specialists. A successful circuit implementation in a chaotic environment is generally difficult, due to the extreme sensitivity of chaos to parameter variations and noise perturbations, and the nonrobustness of chaos to structural stability, within the physical devices. Notwithstanding many technical obstacles, both theoretical and technical developments in this area have gained remarkable progress in the last few years. For instance, some unified control methods have been developed under the nonautonomous Lyapunov stabilization theory; some rigorous anti-control techniques, even for spatiotemporal systems, have been initiated; some novel chaos-based encryption approaches have been advanced; and some chips of chaotic circuits have been made toward commercialization [2].

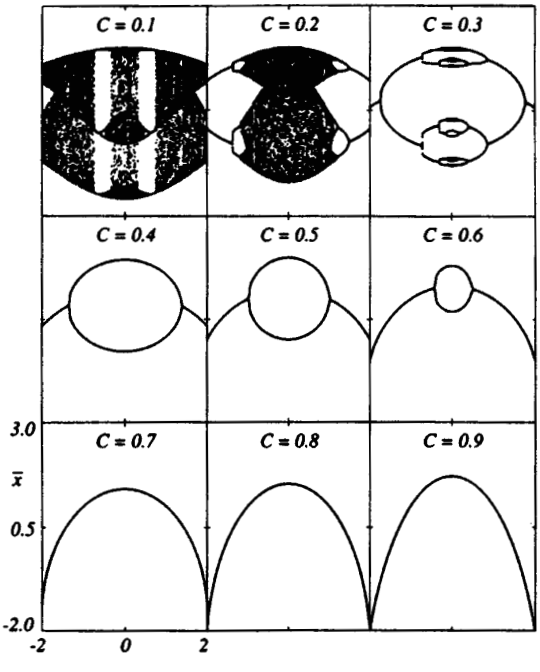


*Figure 2. A broad variety of dynamics can be created and modified when chaos is under control (C is a constant feedback control gain).*

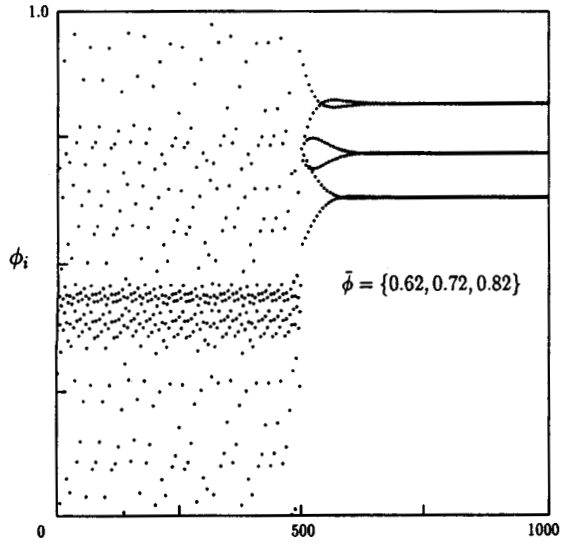


*Figure 3. Controlling the chaotic orbit of a human-heart model to a period-three equilibrium.*

In summary, the emerging field of chaos control and anti-control is very stimulating and full of promise; it is expected to have far-reaching impacts with enormous opportunities in industrial and commercial applications. New theories for dynamics analysis, new methodologies for control, and new circuitry design for implementation altogether are calling for new efforts and endeavors from the communities of nonlinear dynamics, controls, and circuits and systems. The IEEE Circuits and Systems Society has been very active in this field in the past decade, and should continuously maintain its leadership in the field in the future.

[1] G. Chen, "Chaos, Bifurcation, and Their Control," *Wiley Encyclopedia of Electrical and Electronics Engineering*, 1998.

[2] G. Chen and X. Dong, *From Chaos to Order—Perspectives, Methodologies, and Applications*. World Scientific Pub. Co.: Singapore, 1998.

Guanrong (Ron) Chen received the M.S. degree in computer science from the Sun Yatsen University, China, in 1981, and the Ph.D. degree in applied mathematics from Texas A&M University in 1987. His research interest is within the broad area of nonlinear systems, on both dynamics and controls. He is the (co)author of about a hundred journal papers and several research monographs and advanced textbooks including *Nonlinear Feedback Control Systems* (with Rui J. P. de Figueiredo, 1993) and *Hopf Bifurcation Analysis* (with Jorge L. Moiola, 1996). He served as associate editor for the *IEEE Transactions on Circuits and Systems—Part I* from 1993 to 1995.

# …introducing students to electrical engineering

*Thoughts on EE. . . continued from front cover*

1. In most universities, we are still given the important task of introducing students to EE through circuits and systems courses. In the past, this was because the fundamental importance of circuits and systems was recognized, and because we did a pretty good job at getting EE students started.

2. If we are still given the above role, it is mostly because of conservatism in changing the present curricula. Other than that, it is clear that (a) many of our colleagues do not recognize circuits and systems as being fundamentally important anymore, and (b) we no longer do a good job with getting EE students started. I believe that (a) is caused by (b).

3. As a consequence, circuits and systems education, and even EE education in general (because it still starts with circuits and systems), is at a crossroads. The quality of this education, and the very livelihood of many of us, will depend upon whether we act on our problems in an appropriate way, before it is too late.

4. A key to the solution of our problems is the introductory circuits courses which we teach. If we can modernize these successfully, a significant start will have been made.

5. Not only has introductory circuits and systems education not changed fundamentally in the past three decades, but the present way of doing things has entrenched itself through a kind of positive feedback. Texts do things the same old way, and the professors who adopt them get used to that way (and may not have their own strong opinion on the matter, many of them not being CAS specialists [2,4]). These professors feel comfortable adopting texts that do it the same way, more texts are written to address their need, etc. Thus, it is now especially difficult to break this vicious circle.

6. The problem with present courses and texts is not so much that they do not teach principles correctly. It is mostly the *way* in which they teach them, and also what they do *not* teach.

7. The main reason for the inadequacy of the present approaches is not so much that technology has changed (which it has, of course; but Kirchhoff's laws are still valid). It is that *today's students are different*.



8. The present style of most circuits texts was established, and was appropriate, for the students of the 50's. Those students had, in general, two advantages in comparison to today's students: (a) many of them had tinkered [2], and (b) they were lucky enough to have grown up before the era of immediate gratification.

9. Students who had tinkered could see, at least roughly, where the theory they were taught fit. They did not have to wait three semesters to discover why a theorem they were being taught was important and useful. In addition, even if some had not tinkered, or could not see the usefulness of a topic right away, they were patient, since in their other activities, such as games, they did not see results in milliseconds either. You could tell them "learn math and physics, then take circuit theory, then electronics, and you will see why all this is useful in your junior year". Today's students not only have not tinkered (they have hacked instead), but have no patience. If students, ever since they were children, have been used to pressing a button on their computer games and seeing immediate major "results" (such as destroying an asteroid) on their screen, how can we expect them to have three semesters of patience?

10. Because of the above, students respond much better to courses involving flashy computer graphics, computer sound, etc.; they can relate to those because of their extensive exposure to computers and computer games. Thus, when an innovative approach appears using such media, it can win students very quickly. This opens a host of possibilities for a first course. For example, courses on multimedia, or on other subjects using multimedia as a lab, become candidates.

11. Nobody can deny today's importance of multimedia, and teaching using multimedia may be appealing to many educators. One should consider, though, the appropriateness of using such an approach in the *first* EE course. If doing so makes educational sense, we should yield to the changing times. *But does it?* In my opinion it does not, as it perpetuates the students' high-school view of the computer's screen and loudspeakers being the ONLY things that matter. It perpetuates the view that all we have to do is write programs and push buttons, and SOMEBODY ELSE, SOMEWHERE, will deal with the dirty details of designing the hardware. I believe the industry as a whole can ill-afford such an attitude (including the software industry, which needs ever-improved hardware to run its software). If a student is introduced to EE in this way, it may be too late later to attract him/her to endeavors that deal with the real, non-virtual, physical world. What is claimed here is that a *balanced* introduction to EE is needed, *which pays due attention to hardware.*

12. To make such a balanced introduction to EE possible, maybe we should not be talking about courses in circuits and systems, but rather about courses in *circuits and electronics*. Already there are first courses, such as the ones at Berkeley, MIT, Carnegie Mellon, U. of Illinois, Columbia, and elsewhere, which thoroughly combine circuits and electronics, and indeed a lab. Students respond much better to such courses, as they see re-

sults almost immediately. Electronics is the best medium to show the utility of circuit theory to newcomers.

**Experimental Verification:** Examination of the above issues and of the experiences at several other universities (see, for example, [4]), led to the creation of a course, "Introduction to Electrical Engineering", at Columbia University. The course was made available for the first time in the academic year 1996-97 to all FIRST-year students that were considering majoring in EE. It thoroughly mixed circuits with electronics. The course included a lab which dealt with a variety of experiments, e.g. resistive and RC circuits, op amps, diodes, transistors, logic gates, and even a radio receiver. The lab was taught at the level of traditional first labs commonly taken by sophomores, but with emphasis on design and experimentation, rather than on following dry instructions. A final design project was an integral part of the lab. *The students loved this course!* They were able to learn principles, experiment, obtain intuition, and design useful circuits and feel the thrill of seeing them work. These included voice-activated switches, amplifiers, digital counters, etc. More details on the course and the lab will be given elsewhere, where tangible evidence about the success of this approach will be offered; and the way the course connects with the rest of the curriculum will be discussed [5].

**Concluding Remarks:** This short article only talks about the beginning. It goes without saying that there are many other issues in the EE curriculum, which have to be examined. I believe that, while this is being done, action can be taken on the problems discussed here. The first course is a good point to begin!

Comments on the above views are welcome. Please e-mail to tsividis@elab.columbia.edu.

[1] Y. Tsividis, "White Paper on Certain Aspects of CAS Education", prepared for the meetings of the IEEE CAS president's advisory council, April 4, June 6, and September 27, 1997, and disseminated to past and present IEEE officers.
[2] R. A. Rohrer, "Taking Circuits Seriously", *IEEE Circuits and Devices Magazine*, vol. 6, no. 4, pp. 27–31, July 1990.
[3] S. W. Director, P. K. Khosla, R. A. Rohrer, and R. A. Rutenbar, "Reengineering the Curriculum: Design and Implementation of a New B.S. Degree in Electrical and Computer Engineering at Carnegie Mellon", *Proc. IEEE*, vol. 83, pp. 1246–1269, Sept. 1995.
[4] J. Choma, "Vision, Goals, and Tasks", message to CAS officers, Dec. 31, 1996.
[5] Y. Tsividis, "Teaching Circuits and Electronics to First-Year Students", *Proc. Int. Symp. Circuits and Systems*, Monterey, May 31–June 3, 1998 (also in Panel on Circuits, Systems, and Electronics Education at the same symposium).

Yannis Tsividis is professor of electrical engineering at Columbia University. He has also taught as part of regular or visiting appointments at the University of California, Berkeley, the Massachusetts Institute of Technology, and the National Technical University of Athens. He has received the Great Teacher Award at Columbia University.

# CAS Launches ACE Initiative on Video and Wireless Communications

***by Mervyn E. Jones***

Maintaining up-to-date knowledge and professional skills has never been more important than it is today; and there can be no field where this is more applicable than electronics, where the rapid changes are apparent to everybody. Recognizing this the IEEE Circuits and Systems Society has launched a new initiative, an International Program of Advanced Continuing Education (ACE) courses. This will be the first time that the collective technical expertise of the IEEE CAS Society has been assembled to address the continuing professional development needs of engineers.

The first program will be from **November 30 through December 11, 1998**, and will be held in **Phuket Island, Thailand**, in collaboration with Mahanakorn University of Technology, Thailand, and Imperial College, London, UK. A program has been chosen by the ten technical groups of the CAS Society to offer a range of topics within the broad theme of **Video and Wireless Communications**. During this 2-week period, approximately 20 courses (typically of 3-day duration) will be presented by international experts and well known instructors from the CAS Society and will cover many facets of both analog and digital communications. It is expected that the courses will include:

**Advanced Continuing Education Initiative**

- Advanced Circuit Simulation Techniques for Analog Designers
- Adaptive Techniques for Wireless Communications
- Digital Video Processing
- Digital Image Processing Algorithms
- MPEG Digital Audio and Video Technology
- Image and Video Recovery and Enhancement Techniques
- Metrics, Technique and New Developments in Mixed-Signal Testing
- Oversampled ΣΔ Interfaces for CMOS Mixed-Signal Circuits: Principles, Design Techniques, CAD Tools and Testing
- Low-Voltage Low-Power VLSI Design
- Switch-Currents
- Blind Signal Separation and Recovery for Telecommunications
- What You Want to Know about Multi-Media Circuits & Systems
- Analog Integrated Circuit Design and Broadband Circuit and System Applications
- Design Methodology and CAD Tools for Analog and Mixed-Signal Integrated Circuits
- Telecommunication Circuits
- Design of Low-Noise Amplifiers in CMOS and BiCMOS
- Synthesis of Digital Circuits
- Architectures and Circuits for On-Line Image Processing Using CMOS Chips
- VHDL/FPGAs
- Design Strategies for Driving C, RC, & RLC Dominated Interconect

Clearly this program will be attractive to IEEE members and others, presenting the opportunity to attend courses given by international experts. It will also benefit the Society, both by the professional activity that it generates and the exposure that it gives to the IEEE, in countries where currently it is under-represented.

An initial program brochure is being prepared currently and information will be available from the Continuing Education Centre, Imperial College. Tel: +44 171 594 6882; Fax: +44 171 594 6883; E-mail cpd@ic.ac.uk.; Web Page: http://www.ad.ic.ac.uk/cpd. Further details will be available in the next CAS Newsletter.

*Darlington Memorial. . . continued from Page 3*

today in that it was marked by ad-hoc techniques in which complex filters were designed by cascading less complex filter sections whose attenuation characteristics were specified in graphical form. This was often unsatisfactory for several reasons. For example, the theory available did not adequately take into account the loading of the various sections on their predecessors. Sid's brilliant contribution was to recast the filter design problem as two problems: approximation and network synthesis—and to give a solution to each problem. The approximation problem he addressed is to suitably approximate the desired typically idealized filter characteristic using a real rational function of a complex variable, and here Darlington made significant pioneering contributions involving the use of Tchebyscheff polynomials. His main contribution, which concerned the exact synthesis of a two-port network that realized (i.e., implemented) the rational function, was the introduction of his well-known insertion-loss synthesis method. This work by Darlington led to his beautiful structural result that no more than one resistor is needed to synthesize any *RLC* impedance. It is interesting that his results were not widely used until many years after they were obtained. This occurred partially because more exacting computations were required than for the earlier "image-parameter" filter designs; also, due to its novelty, it was not easy for filter designers at the time to fully appreciate Darlington's contributions. This is easier to understand in the context of the history of the development of lumped-constant filter theory which originally was an extension of the theory of transmission lines, and in which originally the concepts of a propagation constant, characteristic impedance, reflection factor, etc. played a prominent role. Sid's work also profoundly influenced electrical engineering education. After World War II, the Darlington synthesis of reactance two-ports was taught to a generation of graduate students who learned that linear circuit design could be formulated precisely in terms of specifications and tolerances, and that the problems formulated could be solved systematically. With concurrent advances in communication and control theory, electrical engineers began to appreciate that higher mathematics was a powerful tool for advanced study and research. This helped pave the way for the introduction of system theory and system analysis, and thus further broadened the scope of electrical engineering education.

Sid's brilliant contribution was to recast the filter design problem as two problems: approximation and network synthesis — and to give a solution to each problem.

During World War II Sid was heavily involved in several studies of military systems. These studies concerned mainly the development of computers for anti-aircraft gun control and bombsights. For a seven month period beginning in 1944 he took a leave of absence to join the United States Office of Field Service. He was assigned to the 14th Anti-Aircraft Command in the Southwest Pacific Area where he served as a consultant and technical observer. It was this work that led to his receipt of the Medal of Freedom.

In addition to never losing interest in circuit theory, Sid retained an interest in military systems—and related systems—throughout his tenure at Bell Laboratories. One of his most important contributions is the invention of what is called "Chirp Radar." The chirp idea is a way to form a pulsed radar's transmitted signal so that relatively high peak power is not needed to achieve long range and high resolution. This involves transmitting long frequency-modulated pulses. The corresponding reflected and received ("chirped") pulses are "collapsed" into relatively short pulses using a network that introduces a time delay that is frequency dependent. The idea has been widely used, and there has been much interest in the design of the needed delay networks—not only at Bell Laboratories, but at many other companies and also at universities. Darlington's IEEE Medal of Honor citation reads: "for fundamental contributions to filtering and signal processing leading to chirp radar."

Sid also did very influential work concerning rocket guidance. In 1954 he ingeniously combined radar-tracking techniques with principles of inertial guidance to develop the highly-effective Bell Laboratories Command Guidance System which has launched many of the United States' space vehicles including NASA's Thor Delta booster and the Air Force's Titan I missile. The system has proved to be remarkably reliable and has played a central role in placing into orbit many satellites including the Echo I communications satellite, Syncom, and Intelsat.

Darlington is best known for an idea that he probably developed very quickly: the Darlington transistor—a simple circuit, comprised of two or more transistors, which behaves as a much improved single transistor. As is well known to the Circuits and Systems community, this idea is widely used and has had a great impact on the design of integrated circuits.

Sid was a visiting professor for periods of time of from one to six weeks at the University of California at Berkeley

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# I-CAS: A Continued Vision…

*Rui J. P. de Figueiredo*
*UC Irvine*

*President's Message. . .continued from Page 3*

academia. And it is the balance of these two streams, that will allow the Society to achieve the type of ideal dynamic equilibrium, conceived in another context, in purely philosophical terms, by Bertrand Russell. The development and implementation of a practical framework for attaining such an equilibrium is one of the major challenges that is facing our Society, in my opinion.

**Principle 2 (Integration):** In the context of the above applications, the Society ought to continue its movement forward on the path of *integration of technologies*—a path from integrated circuits (I-C's) to integrated circuits and systems (I-CAS's).

**Remark:** As highlighted by G. R. Hellestrand in his piece of the PAC–97 Report, another major challenge facing the Society today is how to integrate technologies from silicon all the way to complex systems, meaningfully incorporating electronic hardware/software, mechanical, and human-machine interface concepts. Multimedia objects constitute one vivid example of such systems. As a result, I foresee the thrust of the CAS Society expanding from integrated circuits (I-C's) to integrated circuits and systems (I-CAS's), a term coined by José da Franca.

**Principle 3 (Globalization):** The Society ought to continue its transnational outreach effort oriented toward converting itself into a truly *international professional society*.

**Remark:** This principle, I believe, has been universally recognized but the path for its full implementation has not been too successful at the IEEE level. Recent initiatives, at the Society level, by B. A. Shenoi, G. R. Hellestrand, and R. W. Liu look very promising (See the relevant part of the Summary of the PAC–97 Report).

**Plan of Action**

Because of space limitations I must be brief and will present to you a plan of action in an outline form.

**1. President's Advisory Council (PAC):** This is a resource available to the president and the Executive Committee (ExCom) to carry out work on projects (thrusts) which address the long-range goals of the Society. Typically these projects require the participation of multiple divisions. In order to complete work on the initiatives begun last year, four of the 1997 PAC members have kindly agreed to continue to serve this year. The 1998 PAC will consist of B. A. Shenoi (membership and IEEE-level society superstructure, chair of PAC), J. Choma (education), W. K. Jenkins (research), Rueywen Liu (international affairs), A. E. Dunlop (industry), and Chris Toumazou (short courses). In addition, all members of ExCom are ex-officio members of PAC. My request to PAC this year is kindly to complete, in cooperation with ExCom and BOG, work on the long-range strategic planning for the Society along all the thrusts mentioned above, and help ExCom implement the part of this plan scheduled for this year.

**2. Newsletter Upgrade and a New Society Magazine:** In order to reach out and bring our membership-at-large together in the context of the important current and emerging technological thrusts and applications of the Society, a society magazine is deemed necessary. By an appropriate upgrade, the Newsletter will start immediately fulfilling the role of the magazine, while plans for launching the magazine are being formulated and implemented. The "new" Newsletter, in addition to reporting society news, will publish short lucid articles, written by experts in the field, some describing new approaches to education, others highlighting new or emerging technological and application-oriented thrusts of great interest to the membership-at-large, others still providing visionary perspectives of unfolding technological scenarios and other such topics of interest, etc… I will leave, as I must, the leadership of this initiative and of the following items 3 and 4 in the hands of our VP/Publications Y.-F. Huang.

**3. New *T—MST*:** A proposal for a new *IEEE Transactions on Multimedia Systems and Technology* has been submitted by our Society to the TAB Periodicals Committee, for consideration at its February 12 meeting in Los Angeles. Should this proposal receive this committee's approval, it will be moved expeditiously through other levels of approval from the IEEE administration to allow the periodical to appear as soon as possible. Again I stress that this initiative, if approved, will constitute a living example of implementation of Principles 1 and 2 stated above.

**4. New Niches for *TCAS—I* and *—II*?:** The fundamental question—of what the focal points or niches of the two *IEEE Transactions on Circuits and Systems, Parts I* and *II* (*TCAS—I* and *—II*) should be, has not yet been fully resolved. For the time being, it has been decided that *TCAS—I* will remain general, while *TCAS—II* will address special topics. Is this really the best long-term solution for the content of the two key archival journals of our Society in an era where both authors and readers demand that the periodicals to which they subscribe remain focused on their areas of interest? This is a

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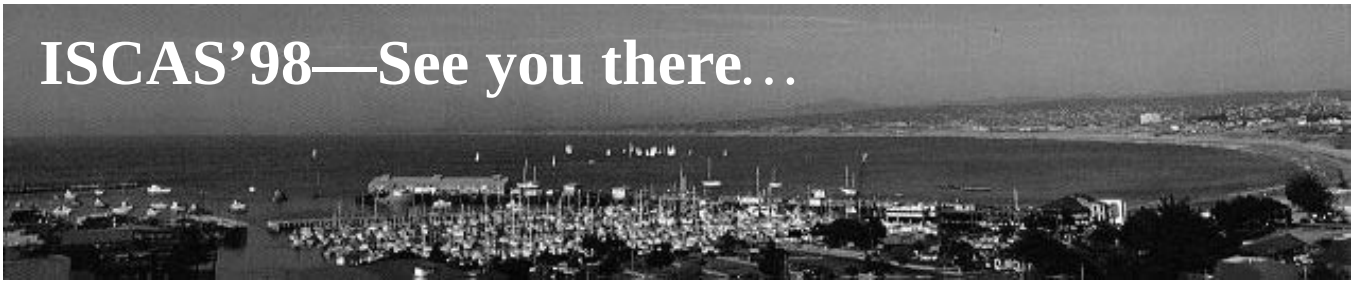


*President's Message. . .continued from Page 9*

question that needs to continue to be addressed by the Society's Publications Division.

**5. Regional Conferences and Specialty Workshops:** Regional conferences, like the MWSCAS and ICECS, and specialty workshops, like the Wireless Workshop to be held in June in Lucerne, and the Mixed Mode Circuit Design Workshop to be held in Newport Beach, California, in November of 1999, constitute activities that are attracting a great deal of interest from the circuits and systems communities given the possible important benefits that they may bring to them at the regional and international levels. Regional conferences must form a coherent pattern in space and time so as to enhance intra-regional activities (in individual regions) as well as inter-regional relationships in an optimal way. As far as specialty workshops are concerned, they constitute a new set of experiments being launched by George Moschytz with respect to the first workshop and by Hari Reddy, Geert DeVeirman, and Phil Allen with respect to the second one. For such workshops to achieve their prescribed goal, it is essential that industry be heavily involved in their planning, delivery, and attendance. The VP/Conferences B. Sheu and his division are asked to kindly provide the above leaders with whatever support that they may require to make this initiative a real success.

**6. Conference Planning and Support:** Over the last two years, the Conference Division has made enormous progress under the direction of Hari Reddy. However, work needs to be completed on a framework for the selection, organization, and scheduling of a limited number of conferences that the Society will support or lend its cooperation. One innovation which appears desirable is for the Society to invite applications for support from potential conference or workshop organizers, with prescribed deadlines for submission during the year, say January 1 and July 1, and then select the best qualified amongst the ones submitted. In this case, such invitations may be announced in the Newsletter and/or on the web and application forms (TMRFs?), for obtaining required information, may be circulated to potential applicants. Another fundamental question that has been raised by some peers is whether the Society should, as a matter of policy, provide support only in the form of loans which may be forgiven if the meeting in reference runs into a debt. Such a policy, it is claimed, will promote greater fiscal responsibility. Other peers take the position that seed grants are essential to incentivize conferences and workshops at least when they are proposed for the first time. These are all issues that fall in the domain of the VP/Conferences B. Sheu and his division, and, hopefully, a policy statement on this entire matter will come out from that division for the consideration by ExCom and BOG this year.

**7. Education:** Implementation of the plans for education formulated last year by John Choma and Chris Toumazou will take place this year by means of: (a) expansion of the Distinguished Lecturers' Program with emphasis on regions that do not have periodic access to technology leaders; (b) delivery of novel instruction of basic circuits and systems courses that facilitate entry into new CAS technologies, such as mixed-mode circuit design; and (c) short course thrusts in Thailand and possibly elsewhere. All these activities will serve as a demonstration of part of the strategic plan developed by the PAC last year.

**8. Research:** This year I will strongly encourage continued emphasis on focused technological thrusts to be implemented in the context of activities across all the divisions, according to Principles 1 and 2 stated above. This effort will be further strengthened by our very active participation in the appropriate TAB and USAB activities.

**9. Technical Activities:** Continuing education in the form of short courses was the main emphasis of the Technical Activities Division last year (see item 7). One issue to be considered this year is how exactly will this division continue playing its role in advancing education. Another issue that the division may like to consider is whether a rearrangement of its technical committees (TCs) is needed in view of the Society's emerging technology/applications thrusts (see items 1 and 8). For example, would it make sense to create TCs on Chaos Processing and Control (see the article in this issue of the Newsletter on this topic), and/or Circuits for Wireless Applications, and/or Communications Circuits and Systems, and/or Mixed Mode Integrated Circuit Design, and/or Hardware/Software Codesign? These are issues for which we will need recommendations from VP/Technical Activities M. Bayoumi and his division.

## New Short Course Announced

**HIGH FREQUENCY CMOS AND BIPOLAR ANALOG DESIGN**
**(Video, RF, Low Voltage, Low Noise, Low Power)**
**March 30–April 3, 1998 at Imperial College, London**

This course has been developed to equip electronics engineers, circuit and system designers, and application engineers with a good appreciation of high frequency analog design techniques, using both RF CMOS and complementary bipolar technologies. In addition to lectures, which will be supported by comprehensive course notes, a feature of the course will be some 'hands-on' laboratory work.

It is expected that participants in this program will have some knowledge and experience in analog circuit design in either CMOS or bipolar technologies.

The course will be presented by Professor Chris Toumazou and Dr. Alison Payne of Imperial College and Professor John Lidgey of Oxford Brookes University.

For a copy of the course brochure, please contact: Ms. Sally Verkaik, Centre for Continuing Education, Imperial College, Room 515 Sherfield Building, Exhibition Road, London SW7 2AZ, UK. Tel: +44 (0)171 594 6882; Fax: +44 (0)171 594 6883; E-mail: cpd@ic.ac.uk; Web Page: http://www.ad.ic.ac.uk/cpd/.

*Rui J. P. de Figueiredo*
*UC Irvine*

**10. World Wide Web:** Arrangements for the location, development, and maintenance of the CAS Society Web site will be completed in coordination with the Society Administrator Barbara Wehner.

**11. Membership Affairs:** The Society will continue to maintain a strong presence in the TAB/RAB Membership Development Committee, which last year generated a very advantageous package for the recruitment of non-members at ISCAS'98. The recruitment of members among students and young professionals ought to be an important concern of the Society. It is my view that the entire membership issue is intimately linked with what I call the "Society Superstructure" issues, namely the active involvement of the Society in various IEEE-level TAB, RAB, PUB, EAB, … activities that provide value-added resources for advancing the Society's mission. This year, PAC, in collaboration with ExCom and BOG, is requested to kindly examine this issue and come up with a set of recommendations on the Society Superstructure.

**12. Intersocietal Relationships:** Cooperation with other IEEE societies in areas of mutual interest, especially at the peer level, will be strongly encouraged. This cooperation is expected to occur in the context of specific activities, such as the initiative in the formation of joint chapters with the SSC Society. Other societies with which, I believe, we ought to be particularly interested in developing close relationships, in view of complementary, and in some instances, some overlapping interests, are the Signal Processing Society, the Communications Society, and the Computer Society. Personally, on the basis of the Principles 1 and 2 stated above, I believe that the Circuits and Systems Society can only stand to gain by developing a policy of inclusiveness rather than exclusivity, and practicing it by cultivating links with any IEEE society whenever such a relationship can strengthen each other's missions.

**13. Transnational Activities:** The enormous progress made last year in transnational activities is expected to continue at the same rate this year as a demonstration of the Principle 3 stated above. Examples are the arrangemts for the Sister-Society Agreements in Region 10; the Group Membership Initiative for developing countries, currently under review by the TAB Transnational Committee; instances of the Distinguished Lecturers' Program mentioned previously; some of the ideas currently being tried and proposed in Region 8 for linking chapter formation activities with regional CAS Society sponsored meetings, the formation of temporary "ad hoc" chapters to stimulate their growth into formal chapters in localities where the CAS Society membership is small, etc. All of these developments are in the hands of the three regional VPs A. Davies, J. Silva, and G. R. Hellestrand, cemented by the cooperation and contributions from PAC.

**14. Constitution and Bylaws:** The updating of the bylaws and of the Field of Interests Statement of the Society is necessary in order to take into account rapidly changing conditions arising from the growth and evolution of the Society's activities. I expect that this issue will be fully addressed this year by the Society's Constitution and Bylaws Committee in close cooperation with ExCom and BOG.

**Conclusion**

I have outlined, above, a continued vision and a plan of action for the Society which I believe is in line with the interests and the sentiment of its members. However, in order to assure that it be fully representative of the aspirations and goals of the membership-at-large, both myself and the Society leadership will greatly appreciate feedback from the members so that the final plan may be accordingly modified and fine tuned.

For this purpose all the members will be receiving in the June 1998 issue of this Newsletter a Survey Questionnaire, and are most kindly requested that, soon thereafter, they fill it out and then return it promptly to the address therein indicated.

In conclusion, I would like to extend my warmest greetings to all the Society members. I consider it a singular distinction and pleasure to serve the IEEE Circuits and Systems Society as its president this year.

It was a great learning experience for me to serve the Society with last year's members of the ExCom, PAC and BOG. I consider myself very fortunate that some members of those groups will continue to serve the Society with me this year, and also that, in the governance of the Society, I will have the collaboration of individuals of such stature and intensity of devotion to the Society as John Choma, George Moschytz, Belle Shenoi, and of members of the 1998 ExCom, PAC, and BOG that I so deeply admire and respect; and last but not least, the support of Barbara Wehner, the new full-time Society administrator, who constitutes a major asset for our entire enterprise.

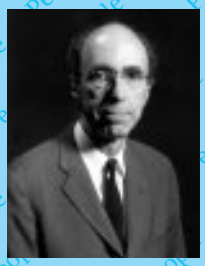
Under these conditions, I have no doubt that this will be a year of real accomplishments and self-fulfillment for all of us in the Society.

## CAS Announces New Industrial Pioneer Award

At the November 1997 Board of Governors Meeting in San Jose, California, Clifford Lau, Vice President for Administration, proposed a new "CAS Industrial Pioneer Award" which was unanimously approved. The purpose of this award is "to honor a person or persons with outstanding and pioneering contributions in developing academic and industrial research results into industrial applications and/or commerical products".

The award is to be presented annually together with the other awards, and given by the Awards Committee on the basis of quality, originality, and significance of contribution. The prize includes a plaque and a $500 cash award that will be divided if there is more than one recipient.

Nominations will be solicited from the CAS membership and officers, and 1998 will be the first year for the award.



The Darlington transistor — a simple circuit comprised of two or more transistors which behave as a much improved single transistor — is widely used and has had a great impact on the design of integrated circuits.

*Darlington Memorial. . . continued from Page 8*

during 1960 to 1972, and in 1978 he was a visiting professor at the University of California at Los Angeles for a month. He gave many lectures and very much enjoyed these visits. Colleagues and students often remarked among themselves about how impressed they were with his keen physical insights, sophisticated mathematical talent, and pursuit of definitive results. After Sid retired from Bell Laboratories, he became an adjunct professor at the University of New Hampshire where he received an honorary doctorate in 1982. He was a consultant to Bell Laboratories during 1971–1974. Darlington held more than 40 patents, and was active in professional society activities. During 1959–60 he was the chairman of the IEEE Professional Group on Circuit Theory, and in 1986 he received the Circuits and Systems Society's first Society Award.

Sid was a man of great personal and professional integrity. He was an intense but gentle man who was surprisingly modest. He was also a gregarious person who knew a lot about many things and had much to say. A colleague once commented that "Asking Sid Darlington a question was like trying to take a drink from a fire hose". Sid is survived by his wife Joan, of Exeter, New Hampshire, two daughters Ellen and Rebecca, and his sister Celia.

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# DARLINGTON MEMORIAL ISSUE

## Call for Papers

*IEEE Transactions on Circuits and Systems—I: Fundamental Theory and Applications*

January 1999

Sidney Darlington, one of the world's most creative and influential circuit theorists, died at his home in Exeter, New Hampshire on October 31 at the age of 91. He was a man of uncommon depth and breath whose first love was circuit theory. He made important widely-known contributions in several areas including network synthesis, radar systems, rocket guidance, and transistor networks.

Darlington was born in Pittsburgh, Pennsylvania. He received the B.S. degree in physics (magna cum laude) from Harvard College in 1926, the B.S. in electrical communication from MIT in 1929, and the Ph.D. degree in physics from Columbia University in 1940. In 1929 he became a member of technical staff at Bell Laboratories where he remained until he retired as head of the Circuits and Control Department. He was a member of both the National Academy of Engineering and the National Academy of Science. In 1945 he was awarded the Presidential Medal of Freedom, the United States' highest civilian honor, for his contributions during World War II. He received the IEEE Edison Medal in 1975 and the IEEE Medal of Honor in 1981. In 1986 he received the Circuits and Systems Society's first Society Award.

The IEEE Circuits and Systems Society will publish a special issue of its *Transactions* to honor the memory of Sidney Darlington. The issue will contain invited as well as submitted papers. Its tentative date of publication is January 1999. Manuscripts may be sent to either of the guest editors:

Dr. Ernest S. Kuh
University of California
Department of Electrical and Computer Sciences
501 Cory Hall
Berkeley California 94720 USA
kuh@eecs.berkeley.edu

Dr. Irwin W. Sandberg
University of Texas at Austin
Department of Electrical and Computer Engineering
Engineering Science Building
Austin, Texas, 78712 USA
sandberg@ece.utexas.edu

Submissions should be in accord with the "Information for Authors" of the *IEEE Transactions on Circuits and Systems—I*. Submissions should be made by May 1, 1998.

# WORKSHOPS

## IASI, ROMANIA ...

*Liviu Goras*
*Romania CAS Chapter Chair*

The third edition of the biannual **International Symposium on Signals, Circuits and Systems, SCS'97**, jointly organized by the faculty of electronics and telecommunications of the "Gh. Asachi" Technical University of Iasi, Romania, and the IEEE Romania CAS Chapter, was held in Iasi on October 2–3. The main topics were circuit and system theory and applications including neural and cellular neural networks, signal processing, communications, power electronics, computer-aided design, etc. More than 150 papers written by authors from more than 20 countries have been published in the proceedings. On this occasion, Professor L. O. Chua, who presented the plenary paper, was awarded the title of Doctor Honoris Causa of the "Gh. Asachi" Technical University of Iasi. The symposium has been a wonderful occasion to create and strengthen the links between academics and researchers. Besides the scientific program, on Saturday, October 4th, most participants enjoyed a post-symposium trip to the well-known monasteries in Northern Romania as well as a wine tasting in the wine-growing district of Cotnari. The next edition, SCS'99, for which details are going to be given in due time, is tentatively scheduled for July 6–7, 1999.

Professor Leon Chua at SCS'97

## CANCUN, MEXICO ...

*José Silva-Martinez*
*Vice President, Region 9*

The **First International Workshop on Design of Mixed-Mode Integrated Circuits and Applications** took place on the beautiful beach of Cancun, Mexico, last July 28–30, 1997. The conference site was the Cancun Convention Center.

The workshop was inaugurated by Professors John Choma, past-president of IEEE-CAS, and Alfonso Serrano Prez-Grovas, general director of the National Institute for Astrophysics, Optics and Electronics from Puebla, Mexico.

There were 12 short courses, given by experts. The courses were organized into two parallel sessions, each course being 3 hours long. The titles of the short courses and the lecturers were: "Analog Low-Voltage Low-Power" by Prof. Edgar Sánchez-Sinencio (TAMU, USA), "Sensor and Interfaces" by Prof. Franco Maloberti (University of Pavia, Italy), "RF Integrated Circuits for PCs and Fiber Optics Comm. Appl.," by Dr. Paul Young (Advanced Technology, USA), "VLSI Communications" by Prof. Thomas Lee (Stanford University, USA), "Artificial Neural Networks" by Prof. Andreas Andreou (JHU, USA),

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| ***Dresden*** | ***1993*** |
| ***Kraköw*** | ***1994*** |
| ***Dublin*** | ***1995*** |
| ***Sevilla*** | ***1996*** |
| ***Moscow*** | ***1997*** |
| ***Budapest*** | ***1998*** |

## NDES CONTINUES ITS TRAVELS

*Anthony C. Davies*
*Vice President, Region 8*

The first of the now-annual international workshops on Nonlinear Dynamics for Electronic Systems took place in Dresden, Saxony, Germany, in 1993, with the support of the IEEE Germany Section and the IEEE United Kingdom and Republic of Ireland Section. It was the first IEEE Circuits and Systems event to be held in the territory of the former East Germany and may have been the first IEEE event of any kind there.

The following year NDES'94 was held in Kraköw, Poland, with the support of the IEEE Poland Circuits and Systems Chapter.

NDES'95 was in Dublin, the first international technical event in Ireland to be supported by the United Kingdom and Republic of Ireland Section Circuits and Systems Chapter.

NDES'96 was in Sevilla, Spain, in the same week as CNNA'96 for the particular reason of linking it with a 60th birthday celebration event for Prof. Leon Chua, University of California, Berkeley. The birthday event took the form of presentations by internationally-recognized experts in non-linear dynamics throughout the day between CNNA'96 and NDES'96. The newly formed IEEE CAS Circuits and Systems Chapter of Spain was, of course, involved.

Last year, NDES'97 was in

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# MORE WORKSHOPS

*Hari C. Reddy*
*California State University at Long Beach*

## LUCERNE, SWITZERLAND ...

In an effort to apply the vast expertise of the CAS Society in the area of circuit and system design to the rapidly growing field of wireless communications, the **1st IEEE CAS Workshop on Wireless-Communication Circuits & Systems** devoted to this theme will be held in Lucerne, Switzerland, from June 22nd to 24th 1998. The workshop will combine presentations by invited experts in the field from academia and industry, with panel and informal discussions.

The topics of the CAS Workshop on Wireless-Communication Circuits & Systems are: RF System Integration (single-chip systems, CMOS RF circuits), RF Front-Ends (CMOS RF oscillators, broadband design techniques), Wideband Conversion for Software Radio (A/D conversion issues, wideband sub-sampling, low-spurious A/D), Process Technologies for Future RF Systems (Si, SiGe, GaAs, CMOS, packaging technologies), DSP for Wireless Communication, (DSP algorithms, fixed point systems, DSP for baseband applications), Blind Channel Equalization (adaptive interference suppression, design techniques, channel estimation).

The list of invited speakers include: Gordon Aspin (The Technology Partnership, UK), Mihai Banu (Lucent Technologies, USA), John Choma (University of California, USA), Rob Christ (TriQuint Semiconductor, USA), Bruno Haller (ETH Zürich, Switzerland), Stefan Heinen (Siemens, Germany), Qiuting Huang (ETH Zürich, Switzerland), C. A. King (Lucent Technologies, USA), Carlos Leme (IST, Lisbon, Portugal), Jenshan Lin (Lucent Technologies, USA), Heinrich Meyr (RWTH Aachen, Germany), Gilles Miet (Philips Consumer Communications, France), Peter Mole (Nortel, UK), Vincent Poor (Princeton University, USA), Behzad Razavi (University of California, USA), Raf Roovers (Philips Research Labs, The Netherlands), Bang-Sup Song (University of Illinois, USA), Michiel Steyaert (K. U. Leuven, The Netherlands), Lang Tong (University of Connecticut, USA), John Treichler (Applied Signal Technology, USA), Rob Woudsma (Philips Research Labs, The Netherlands).

The workshop co-chairs are Professors George S. Moschytz and Ruey-wen Liu.

Those interested in participating are invited to contact workshop coordinator Dr. M. Helfenstein, Institute for Signal and Information Processing, ETH-Zentrum, 8092-Zurich, Switzerland; E-mail: helfenst@isi.ee.ethz.ch; Phone: (+411) 632 3619; Fax: (+411) 632 1208. You may also contact (USA coordinator) Professor Hari C. Reddy at (562) 985–5106; Fax:(562) 985–8887; E-mail: hreddy@engr.csulb.edu

Up-to-date information and registration is available at http://www.isi.ee.ethz.ch/workshop98.

## GUANAJUATO, MEXICO ...

The **Second International Workshop on Design of Mixed-Mode Integrated Circuits and Applications** will be held in Guanajuato, Mexico, from July 27–29, 1998. The workshop is sponsored by the IEEE-CAS Regions 8 and 9 and the IEEE-CAS Chapter Puebla, National Institute for Astrophysics, Optics and Electronics (INAOE), and Mexican Federal Commission for Telecommunications (COFETEL). The conferences will be devoted to presentations and discussions on the state of the art of microelectronic circuits and are intended for engineers, researchers and graduate students interested in looking into the state of the art of IC design and practical implementations. A major purpose of the workshop is to continue extending the knowledge of CAS disciplines, especially in the Latin American regions.

The workshop will include six short courses on selected advanced aspects by world recognized researchers from both academy and industry, and presentations of contributed papers. Every short course will be open to attendees.

The main topics to be covered are low-voltage, low-power circuits, analog integrated circuits, A/D and D/A converters, RF circuits, mixed-mode testing and fault diagnosis, sensors, interfaces and specific applications, and related subjects.

Authors are invited to submit papers to the workshop. **The deadline for submission of summaries is May 3, 1998**, for notification of acceptance: June 5, 1998, and for submission of camera-ready papers: July 5, 1998.

All questions or inquiries for further information should be directed to: José Silva-Martinez, Program Co-Chairman, P.O. Box 51 or 216, 72000 Puebla, Mexico. E-mail: workshop98@inaoep.mx; Phone: +(22) 47–05–17; Fax: +(22) 47–05–17 or +(22) 47–25–80; Web page: www-elec.inaoep.mx/workshop98/intro.html

***— José Silva-Martinez***
***Program Co-Chair***

## BUDAPEST, HUNGARY ...

The sixth annual workshop on **Nonlinear Dynamics of Electronic Systems (NDES'98)** will be hosted by the Department of Measurement and Information Systems, Technical University of Budapest, in Budapest, Hungary, on July 16–18, 1998.

This is an international specialist workshop organized by the Department of Measurement and Information Systems, Technical University of Budapest, Hungary, in association with the IEEE CAS Society, the IEEE CAS Nonlinear Circuits and Systems Technical Committee, the Hungarian National Committee for Technological Development (OMFB), IEEE Region 8, and the European Circuits Society.

The workshop will address theoretical and practical issues in nonlinear electronic devices, circuits and systems, with an emphasis on dynamic behavior, chaos and complexity. The official language of the workshop will be English.

The goal of NDES is to bring together engineers, mathematicians, and physicists from across Europe in a low-cost informal setting to address open nonlinear problems in elec-

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# WORKSHOPS CONTINUED

*Cancun. . . continued from Page 13*

"Floating Gate Circuits and Floating Gate Circuits Design" by Prof. Jaime Ramirez-Angulo (NMSU Las Cruces, USA), "A/D and D/A Converters" by Prof. José E. Franca (IST, Portugal), "Spread Spectrum Techniques" by Prof. Gordana Jovanovic Dolecek, (INAOE, Mexico), "Fault Diagnosis and Testing of Analog Circuits" by Dr. Jose Luis Huertas (CNM, Spain), "Testability Evaluation Methodologies in Mixed-Signal Circuits" by Prof. Andrew Richardson (Lancaster University, UK), "Continuous-Time Filters" by Prof. José Silva-Martinez and Prof. Guillermo Espinosa-F.V. (INAOE, Mexico), and "Digital Filters: From Basic Principles to Current Trends" by Prof. Paulo S. Ramirez Diniz and Prof. Eduardo Barros Da Silva ( FURJ, Brazil).

In addition 24 papers were presented in four sessions: Analog Circuits, Digital Systems, Bioengineering, and Modeling. These papers were published in the proceedings of the workshop.

In attendance were about 50 researchers from several countries, including USA, Italy, England, Spain, Portugal, Brazil, Peru, and Mexico.

The workshop served as a forum, where many important advances in circuits and systems were presented and where industry and academia came together to present and discuss the state of the art of microelectronic circuits.

The co-sponsors were: IEEE-Circuits and Systems Society Regions 8 and 9, IEEE-CAS Chapter Puebla, National Institute for Astrophysics, Optics and Electronics (INAOE), and Mexican Federal Commission for Telecommunications (COFETEL). The workshop was organized by IEEE Chapter Puebla, National Institute for Astrophysics, Optics and Electronics, and The Latin American Coordination Group for Research on Electronics (LACE).

The Second International Workshop on Design of Mixed-Mode Integrated Circuits and Applications, will be held in Guanajuato, Mexico from July 27–29, 1998. Additional information can be found on the web page: www-elec.inaoep.mx/workshop98/intro.html.

*Budapest. . . continued from Page 14*

tronics. Recent successes of the NDES workshops include advances in the theory of digital filters, sigma-delta modulators and phase-locked loops, the development of computer-aided analysis and synthesis tools for nonlinear systems, design rules for RF oscillators, nonlinear signal processing techniques, novel chaotic communications strategies, and nonlinear building blocks for analog signal processing.

Requests for further information may be sent to: Dr. Géza Kolumbán, Department of Measurement and Information Systems, Technical University of Budapest, H-1521 Budapest, Hungary; or the Conference Secretariat—Tel: +36–1 463 2057; Fax: +36–1 463 4112; or E-mail: ndes98@mmt.bme.hu.

Information about the workshop is also being provided on the Internet at the NDES'98 website: http://www.mmt.bme.hu/events/ndes98/.

*NDES. . . continued from Page 13*

Moscow, where there is now also an IEEE Circuits and Systems Chapter—this venue opened the event to many who had been unable to attend the previous workshops, although entry-visa difficulties resulted in some others being unable to be present. A substantial financial donation from the IEEE Circuits and Systems Society to support the organization costs of the Moscow workshop was very much appreciated.

The two-day NDES'97 Workshop in Moscow was held in the Hotel Orlenok, where most of the foreign participants stayed. This hotel is to the southwest of the city, not far from the Academy of Sciences building, in a pleasant rural area near the huge Moscow State University. From the hotel, excellent views across to the center of Moscow were available. Foreign guests had the added interest of living in a large international hotel where almost no English was spoken. The number of papers presented required three parallel sessions for parts of the workshop, and the overall realization and successful format of this truly international event in a Moscow venue was a substantial achievement of the organizing committee. NDES'97 provided an exceptional opportunity for personal contacts between research workers from various parts of the Former Soviet Union (FSU) and those from Western Europe and elsewhere, and is a demonstration of the role which IEEE and its chapters can take in encouraging such events.

The NDES workshops have always had the aim of being accessible events for those working this field from both Eastern and Western parts of Region 8, enabling them to meet together and learn about one another's research activities and interests, and also of being accessible at low cost to research students. It has also been the policy to select attractive venues where the local organizers are associated with prominent research in non-linear dynamics for electronic systems. Following these aims the next workshop (NDES'98) will take place in Budapest in July 1998, associated with the Budapest Technical University and the IEEE Hungary Circuits and Systems Chapter.

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# FELLOW PROFILES-1998

Antonios G. Constantinides

## Antonios G. Constantinides

*For contributions to the development of digital signal processing methods.*

A.G. Constantinides is professor of signal processing and head of the signal processing and digital systems section of the Department of Electrical and Electronic Engineering at Imperial College, London. Professor Constantinides' recent work has been directed toward the demanding signal processing problems arising from the area of telecommunications.

Dr. Constantinides has published a range of books and papers in learned journals in the area of DSP and its applications. He served as the first president of the European Association for Signal Processing (EURASIP) and has contributed in this capacity to the establishment of the European Journal for Signal Processing. He has been on, and is currently serving as, a member of many technical program committees of IEEE international conferences. Dr. Constantinides organized the first ever international series of meetings on digital signal processing, in London initially in 1967, and in Florence (with Vito Cappellini) since 1972. In 1985 he was awarded the Honour of Chevalier, Palmes Academiques, by the French government, and in 1996, the promotion to Officier, Palmes Academiques.

Dr. Constantinides presently is serving as a member of the Signal Processing Society Technical Committee on Neural Networks and member of the Board of Governors of the IEEE Signal Processing Society.

Asad M. Madni

## Asad M. Madni

*For contributions to the design and development of instrumentation for electronic warfare systems.*

Asad M. Madni is president and CEO of BEI Sensors and Systems Company, since 1992, where he is involved in the development of microminiature sensors and intelligent sensor based systems. Prior to this he was with Systron Donner Corporation for 18 years where he served in various senior technical and executive positions, eventually as chairman, president, and CEO. He was responsible for the development of intelligent, miniature electronic warfare, radar and instrumentation systems. His degrees include the A.A.S. from RCA Institutes in 1968, the B.S. and M.S. from University of California, Los Angeles, in 1969 and 1972, respectively, and the Ph.D. from California Coast University in 1987. Dr. Madni is an internationally recognized authority in intelligent system design and signal processing and is credited with over 60 refereed publications and numerous patents resulting in "industry firsts". He served as west coast chair/director on the editorial review board of *Microwave Systems News* and as technical advisor to *Test and Measurement World* from 1980–1989. He was chair of the IEEE MTTS s.f. valley chapter in 1992–93 and has been a member of its advisory board since 1982. He has also been a member of the IEEE Aerospace Conference technical review committee since 1994. Dr. Madni has served as chair for numerous IEEE and international conferences. He has given invited lectures worldwide to both governments and institutions, and is the recipient of numerous awards and honors.

Tadayoshi Enomoto

## Tadayoshi Enomoto

*For contributions to the development of integrated circuits for multimedia.*

Tadayoshi Enomoto received the M.Sc. and Ph.D. degrees in electrical engineering from Ohio State University in 1972 and 1975, respectively. He was a senior researcher and department manager from 1975 to 1992 at NEC Microelectronics Research Laboratories where he conducted research in the area of CMOS VLSIs including CCDs, switched-capacitor filters, video encoders, vector processors, memories, etc. Since 1992, he has been a professor at Chuo University, Tokyo, Japan. He was involved in the world's first vector processor VLSI for super computers and a dictionary search processor VLSI. His present research includes the development of motion picture encoding algorithms, video encoder architectures, various types of CMOS, BiCMOS, GaAs LSIs and future VLSIs. He has authored and coauthored 3 books, published more than 200 technical papers on analog and digital VLSIs, and has been awarded 40 patents in Japan and 8 patents abroad. Dr. Enomoto has been the recipient of several awards including the *IEEE Journal of Solid-State Circuits* 1992 Best Paper Award, the 1995 Achievement Award from the Institute of Electronics, Information and Communication Engineers (IEICE) of Japan, and the Chuo University Award in 1993 and 1997. Dr. Enomoto served as an associate editor of the *IEICE Transactions on Electronics* and a guest editor for several special issues of the same *Transactions*. He also served as a chairperson of IEICE technical groups both on integrated circuits and devices, and on electron devices.

# IEEE CAS MEMBERS

## Mark E. Law

*For contributions to integrated circuit process modeling and simulation.*

Mark Law is professor of electrical and computer engineering at the University of Florida. He received the B.S.Cpr.E. degree from Iowa State University in 1982, the M.S.E.E. from Stanford University in 1982, and the Ph.D. degree from Stanford University in 1988. He worked at Hewlett Packard from 1982–85, and joined the faculty at Florida in 1988. He is currently co-director of the Software and Analysis of Advanced Materials Processing (SWAMP) center at Florda.

His current research interests are in integrated circuit process modeling and characterization. As a graduate student he co-authored SUPREM-IV, and his research group at Florida has developed FLOOPS, Florida Object Oriented Process Simulator. His research focused on the modeling of point defects and dopant diffusion in silicon. The FLOOPS development effort won the 1993 Semiconductor Research Corporation (SRC) Technical Excellence Award. Dr. Law was named a National Science Foundation Presidential Faculty Fellow in 1992, Outstanding Young Alumni of Iowa State in 1994, and College of Engineering Teacher of the Year in 1996–97.

He is editor-in-chief of the *IEEE Journal on Technology Computer Aided Design*, and has served as editor of the *IEEE Transactions on Semiconductor Manufacturing*. He chaired the 1997 Simulation of Semiconductor Process and Devices meeting, and will chair the 2000 International Electron Devices meeting. Dr. Law has written over 100 papers in the area of process and device modeling.

Mark E. Law

## Barry K. Gilbert

*For developments of improved electronic packaging for high performance gallium arsenide integrated circuits.*

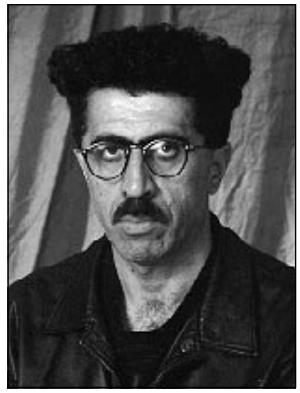
Barry K. Gilbert received the B.S. degree in electrical engineering from Purdue University in 1965, and the Ph.D. degree in physiology and biophysics with minors in applied mathematics and electrical engineering, from the University of Minnesota in 1972. He is presently a staff scientist and professor in the Department of Physiology and Biophysics, Mayo Foundation, Rochester, Minnesota. His research interests include the design of special-purpose digital processors for high-speed signal processing, and the development of advanced integrated circuit and electronic packaging technologies to support real-time signal processing of extremely wideband data. He has worked on a variety of projects, including the development in the 1970s of a very wideband special-purpose digital data handling and array processing computer fabricated entirely with subnanosecond emitter coupled logic, and a special-purpose multiple instruction, multiple data (MIMD) processor capable of operating with up to 30 coprocessors under parallel microcode control. More than 65 digital Gallium Arsenide (GaAs) Indium Phosphide (InP), and Silicon Germanium (SiGe) chips have been designed in his laboratory during the past decade, most recently several GaAs Heterojunction Bipolar Transistor (HBT) chips capable of operating above 10 GHz clock rates. He is currently responsible for the development of CAD tools at system and GaAs integrated circuit levels, as well as high density electronic packaging technologies based on deposited and laminated metal-organic MCMs, which will allow the fabrication of signal processing modules operating at multi-GHz clock rates.

Barry K. Gilbert

## Ali Saberi

*For contributions to singular perturbation theory and nonlinear control.*

Ali Saberi received the B.S. degree from Teheran University in 1967, and the M.S. and Ph.D. degrees in electrical engineering, both from Michigan State University in 1983. From 1967 to 1979 he was a civil engineering consultant. From 1979 to 1983 he was a research assistant at Michigan State University. Since 1983 he has been on the faculty of Washington State University, currently as professor in the School of Electrical Engineering and Computer Science. Professor Saberi's research interests are in nonlinear systems, adaptive systems, large-scale systems, nonlinear control, adaptive control, linear robust control, optimal control, and adaptive filtering. He has served as associate editor of *IEEE Transaction on Automatic Control*, and is currently associate editor of *Automatica* and editor of the *International Journal of Robust and Nonlinear Control*. He is the author or coauthor of a number of research articles in the area of linear and nonlinear systems and control, and the two books, *Loop Transfer Recovery: Analysis and Design* (Springer Verlag 1993), and $H_2$ *Optimal Control* (Prentice Hall International 1995).



Ali Saberi

# PROPOSED LONG-RANGE GOALS AND PLANS FOR THE IEEE CIRCUITS AND SYSTEMS SOCIETY

*Comprehensive Summary of a Report by the 1997 President's Advisory Council (PAC–97)*
*(The full Report, including the white papers referenced in this article, should be available on the web in March, 1998)*

***by***
***Rui J. P. de Figueiredo***
***1997 President-Elect and Chair of PAC–97***

This represents a comprehensive summary of a report [1] by the President's Advisory Council (PAC) on the results of deliberations, over a period of about seven months, on long-range goals and plans for the Society. The council was established by president John Choma in his admirably insightful and holistic statement entitled "Vision, Goals, and Tasks", published in the March 1997 issue of this Newsletter.

PAC was charged with the "responsibility of developing, and ultimately formally proposing to the Board of Governors, a three-year strategic plan for our Circuits and Systems Society". The council was to focus attention on five thrusts to be driven respectively by five highly qualified colleagues. I was given the honor of chairing the council and was allowed considerable flexibility to mould it according to the best interests of the Society.

From the outset, it was made clear to everyone concerned that the council ought to seek out and incorporate in its recommendations the ideas, and possibly opinions, of the Executive Committee, the Board of Governors, the Society membership-at-large, and even sources outside our Society. This mandate the council carried out in a very collegial spirit. To all the peers who have contributed explicitly or implicitly to the content of the present report we convey our heartfelt thanks.

The strategic plan for the Society was organized in terms of five thrusts. These, together with the individuals responsible for advancing and coordinating them, are listed below.

**1. Education:** Prof. Y. Tsividis (with cooperation from Profs. F. Maloberti and K. Jenkins)
**2. Research:** (Academic, Industrial and Public Sectors): Prof. K. Jenkins (with cooperation from Prof. G. Hellestrand)
**3. International Activities:** Prof. R.-W. Liu, Chair, PACIA (PAC International Activities) subcommittee (consisting of Profs. P. S. R. Diniz, G. Hellestrand, M. Lightner, R.-W. Liu, F. Maloberti, I. Sirakawa, C. Toumazou, J. Choma, and R. de Figueiredo)
**4. Membership Affairs:** Prof. B. A. Shenoi
**5. Society Infrastructure:** Prof. M. Lightner

PAC met three times: on April 4, in Los Angeles; on June 8 in Hong Kong, and on September 27 in New York. Executive Committee members were invited to these meetings. Some of them attended and contributed to the PAC mission. In addition, PACIA held a meeting in Hong Kong with the participation of leaders from India (Prof. S. Dutta Roy) and China (Prof. Chai Zemming). As a follow-up, Prof. Liu was invited and attended the Executive Committee meeting of the Chinese CAS Society on July 13 and 14 in Beijing; and I visited Argentina and Chile on a mission of Distinguished Lectureship and of support of CAS regional activities in Region 9. Finally, some of the PAC members participated in the Executive Committee meetings of April 5, June 8, and September 27–28, where some of the issues being studied by PAC were discussed.

The deliberations at all the above-mentioned meetings and additional discussions that took place by e-mail and phone led to the results presented in the PAC–97 Report. These appear in the full PAC–97 Report in the form of eight white papers and an appendix, distributed as in Table 1.

Below we highlight the conclusions reached in these documents.

**1. Education**

**(a) Goal: Through its committees and the activities under its purview, the Society should mentor and promote**

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It should be stressed that the article should not try to mystify the student but enable the student to learn more about technical material that he/she may or may not become acquainted with in their formal course work.

Length of article can be no more than 10 manuscript pages (8 1/2 x 11) reduced by number of figures. Shorter papers also acceptable.

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If interested, contact: Dr. George W. Zobrist, Editor, IEEE Potentials Magazine, Department of Computer Science, 1870 Miner Circle, University of Missouri-Rolla, Rolla, MO 65409. Phone: 573–341–4492; Fax: 573–341–4501; E-mail: zobrist@umr.edu. Further information can be found at: HTTP://WWW.CS.UMR.EDU/POTENTIALS

**education in all areas pertinent to circuits and systems.**

**(b) Undergraduate Education:** At the undergraduate level, the education process should take into account the mindsets of the modern generation of students, accustomed from early age to the use of computers in the classroom and to the instant gratification provided by computer games ... a generation of 'hackers' rather than "tinkerers". Most current introductory circuits and systems courses and textbooks are old-fashioned and do not provide the motivation and the perspective needed to capture the attention, interest, and imagination of this type of student. See the white papers by Tsividis and Maloberti for details. Hence:

**Recommendation: Undergraduate curricula and methods of teaching circuits and systems ought to be reformed.** They should **develop ways of judiciously combining physical understanding and insight with analytical and computer skills, and provide abundant motivation to beginning students.**

This reform may be implemented and advocated in a number of ways, for example by the Society encouraging the writing of new introductory texts, the staging of prototype courses in video, and appropriate modification of ABET requirements; through a pro-active role of the Society leaders at academic and professional meetings and events; through the posting of comprehensive statements on "what-to-teach", "why-to-teach", and "how-to-teach" on the world-wide-web, etc.

**(c) Graduate Education:**

**Recommendations:**

(i) To the extent that it is appropriate, the **Society should provide guidance and encouragement to programs in education that focus on a selected set of emerging technologies and applications**, relevant to circuits and systems, recommended in the white papers of Jenkins and Hellestrand (see the listing of the technologies under "Research" below).

(ii) A comprehensive framework for **universal participation of undergraduate and graduate students in the Society activities, including incentives such as appropriate grants, competition prizes and awards**, at the chapter and conference levels, should be established. See the white papers by Jenkins and R.-W. Liu for details.

(iii) Finally, a **continuing education short course program** that will port circuits and systems technologies and applications to sites where large bases of current or potential end-users are located should be developed. For an example see the Addendum on ACE to the full report.

| Thrust | White Paper # | Author |
|---|---|---|
| Education | 1 | Tsividis |
| " | 2 | Maloberti |
| Research | 3 | Jenkins |
| " | 4 | Hellestrand |
| International (PACIA) | 5 | Liu |
| " | 6 | Hellestrand |
| Membership | 7 | Shenoi |
| Society Infrastructure | 8 | Lightner |
| Addendum (ACE) | | Choma |

*Table 1*

**2. Research**

**(a) Goal: The Society should develop a comprehensive policy and course of action for research in emerging technologies and applications pertinent to circuits and systems; and exert appropriate influence toward implementation of this policy in the academic, private, and public sectors of the global arena.**

**(b) Recommendations:** A comprehensive set of recommendations appears in the white papers of Jenkins and Hellestrand. We summarize them below.

(i) Research should **focus** on **selected technologies and applications thereof**. According to Hellestrand these can be grouped into **circuits** or "**pure technologies/applications**" and **systems** or " **mixed technologies/applications**". A list of the six pure technologies recommended by Jenkins and the mixed technology recommended by Hellestrand follows. (For their comprehensive discussion see the white papers of Jenkins and Hellestrand.)

**—Pure Technologies/Applications (Circuits):** (1) Nanostructure Electronics (device physics, nanostructure circuit theory, nanoscale CAD); (2) Human-Computer Interaction (speech recognition, graphics, displays, multimedia); (3) Wireless Communications (coding, signal processing, networking, mobile computing, low power circuits); (4) Nonlinear Technologies (neural networks, chaotic systems, nonlinear signal processing); (5) Low Power Electronics (VLSI circuits, optoelectronics, optical storage, portable (hand-held) devices); and (6) Video Technologies (electronics and signal/image processing).

**—Mixed Technologies/Applications (Systems):** This is a novel research area involving hardware/software co-design, not too familiar to academics. It appears that the definitions of sub-categories in this area have not yet been finalized.

(ii) Create a CAS Research Initiative Board (RIB) with representatives from industry and academia to coherently **advocate continued basic research funding in electronics** with funding agencies in the public sector of the national and international arenas (See Jenkins's wp (white paper)).

(iii) To satisfy private sector (industry) needs, **involve industry technologists in Society conference events taylored to industry interests**, such as "industry day", and **facilitate student intern programs**. (See Jenkins's wp).

(iv) **Facilitate world-wide research cooperation** through cooperative educational programs at the international level and through cooperative relationships with multi-national corporations. (See Jenkins's wp).

**3. International Activities (PACIA)**

**(a) Goal: To achieve a vibrant globalization of the CAS Society through: (1) strengthening the administrative structure of the regional offices (pertaining to Regions 8, 9, and 10); (2) strengthening the link between the regional offices and the CAS regional chapters and members; and**

*. . . continued on Page 20*

*PAC Summary. . .continued from Page 19*

**(3) developing a comprehensive mutually beneficial relationship between the IEEE CAS Society and other national (or regional) CAS Societies.**

**(b) Recommendations:** To achieve the above objectives, a set of comprehensive recommendations have been made in the white papers of Liu and Hellestrand. These include (i) new stabler and more efficient structures for regional offices and chapters; (ii) installation of regional networks and web pages; (iii) development and support of a comprehensive program of regional conferences and other events such as annual chapter meetings; (iv) blueprints for comprehensive agreements with other national (or regional) CAS societies with mutually advantageous features regarding access to each other's publications and conferences, and joint membership dues; and (v) institution of 300 regional IEEE CAS membership awards to foment formation of regional chapters. Preliminary contacts made by Liu with the national society leaders from India and China and by de Figueiredo with those from Argentina and Chile look quite promising.

**4. Membership Affairs**

**(a) Goal: To develop and implement a best strategy for membership retention and recruitment.**

**(b) Status:** The size of the Society membership is an important indicator (measure) of how well the Society is performing. It turns out that this size has been steadily declining from 18,350 on December 31, 1992 to 15,630 on December 31, 1996. This situation is expected to be further aggravated with a likely flight of a large number of the current members to the Solid State Circuits Society when the latter becomes fully operational. Professor Shenoi has been studying ways of reversing this trend. He is a member of the IEEE Membership Development Committee.

**(c) Recommendations:** (i) As a result of a constructive dialogue with IEEE officials, Shenoi has obtained for the Society a very advantageous package for the recruitment of nonmembers at ISCAS'98. For details see his white paper. This has resulted in the first of the two Action Items proposed below.

(ii) Shenoi's other recommendation, which resulted in the second Action Item below, is to conduct an opinion survey at ISCAS'98 to determine from members and nonmembers how the Society can best satisfy their needs. This in turn will help us to develop a strategic plan with the widest membership appeal.

**(d) Action Items**

(i) The president-elect, as chair of Regional Activities, or a person designated by him, moves that the CAS Board of Governors approve the pilot program to recruit non-members who register at nonmember rate, at ISCAS'98. The program is sponsored by the IEEE Membership Development Committee to test the effectiveness of such a program to recruit new members. The marketing department of IEEE will pay the full annual dues for one year, under this pilot program. According to this program, the CAS Society will pay only the Society membership fees and a choice of one year subscription to one of the *CAS Transactions*, when they become members of IEEE.

(ii) The president-elect, or a person designated by him, moves that the CAS Board of Governors (BOG) approve holding an opinion survey within the next few months to get the opinion of CAS members and non-members in order to enable the CAS Society to delineate and carry out its mission in the best interests of its current and potential members. In consultation with the president, the president-elect will appoint a person to conduct the survey. The BOG approves an expenditure tentatively not exceeding $10,000 to conduct the survey. He will submit a report to BOG about the findings of the survey, when it is completed.

**5. Society Infrastructure**

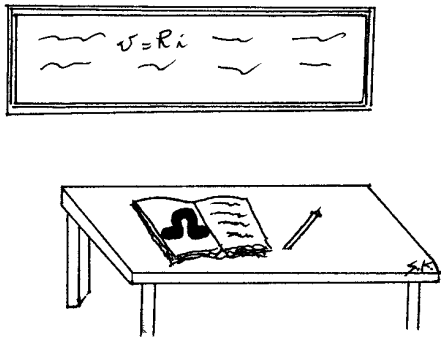
**(a) Goal: To establish a Society administrative structure that will support most efficiently and gracefully, and provide stability and continuity to, the multi-faceted operations of the Society.**

**(b) Recommendation:** This issue was carefully investigated by Professor M. Lightner. The results of this study are reported in his white paper. Lightner's study presented four options: (i) Return to volunteer support; (ii) Employ a full/part time administrative assistant; (iii) Set up an executive office with administrative support; and (iv) Set up an administrative office and hire a consultant for organizational advice. For this purpose two entities were considered represented respectively by Ms. Barbara Wehner and Mr. Bob Wangemann. After careful consideration of both cases the Executive Committee concluded that Ms. Wehner best satisfied the Society's requirements. The Executive Committee is submitting an Action Item to the Board of Governors proposing that Ms. Wehner's services be contracted, in the form of the option (ii) above, for a period of five years.

[1] "Proposed Long-Range Goals and Plans for the CAS Society", Report by the President's Advisory Council (PAC) including the PACIA (PAC International Activities) Sub-Committee, San Jose, CA., November, 1997.

*THE ADVENTURES OF …*
*…THE 'UMBLE OHM*

…Shlomo Karni

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409 Dana Research Building
Northeastern University
Boston, MA 02115, USA

**IMPORTANT DATES**

| | |
|---|---|
| **March 6, 1998** | **Submission of papers** |
| **May 8, 1998** | **Notification of authors** |
| **June 15, 1998** | **Receipt of photo-ready paper** |

More information regarding the conference will be posted at:

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Fax: +81–92–632–5204
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**** CALL FOR PAPERS ****

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**December 4, 1998**
**Bucharest, Romania**

Organized by the Faculty of Electrical Engineering, "Politehnica" University of Bucharest, the symposium includes some sections devoted to circuit theory, VLSI circuits, signals and signal processing. It is one of the main events supported by the Romania CAS chapter, and is also supported by the IEEE Romania Section.

*Deadline for paper submission:* **July 30 1998**

**For further information, contact:**
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Phone/Fax: +401.410.43.55
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Bucharest

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Lisbon

# LX 98

## ICECS

5th IEEE
International Conference on
Electronics, Circuits and Systems

**September 7–10, 1998**
**Instituto Superior Técnico**
**Lisboa, Portugal**

You are invited to participate in the 1998 IEEE International Conference on Electronics, Circuits and Systems to be held in Lisbon on September 7–10, 1998. This is the fifth annual conference promoted by the IEEE Region 8 in cooperation with the IEEE Circuits and Systems Society, devoted to all aspects of theory, design, implementation and application of electronics, including analog, digital, solid-state, high-speed, automotive, biomedical, industrial, communication, multimedia and consumer electronics. It will include regular and poster sessions as well as special sessions and key note speakers on specific advanced topics. A Tutorial Day will be held on September 10 after the three day conference.

In addition to the technical program, conference participants will have a unique opportunity to visit EXPO'98, the last World Exposition of this century which Lisbon will host from May 26 to September 30. A number of sightseeing tours and post-conference escapes have also been arranged to give participants a wide range of choices to enjoy beautiful surroundings, revisit history or simply relax.

**General Chair**
José E. da Franca

**Technical Program Chair**
Pedro Guedes de Oliveira

**For further information, contact:**

**ICECS'98 Secretariat**
Instituto Superior Técnico, Center of Microsystems
Av. Rovisco Pais, 1, 1096 Lisboa Cedex, Portugal
Tel.: +351 1 8417677 Fax: +351 1 8417675
e-mail: icecs98@ecsm4.ist.utl.pt

**Web Site:** http://ecsm3.ist.utl.pt/icecs98

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*\ \ \ CALL FOR PAPERS / / /*

# 1998 IEEE Asia-Pacific Conference on Circuits and Systems

APCCAS

**\ \ \ \ November 24–27, 1998 \ \ \ / / / Chiangmai, Thailand / / / /**

The 1998 IEEE Asia-Pacific Conference on Circuits and Systems(APCCAS'98) is the fourth in the series of biennial Asia-Pacific Conference sponsored by the IEEE Circuits and Systems Society and the National Electronic and Computer Technology Center of Thailand. It will be held at the Chiangmai Plaza Hotel, Chiangmai, Thailand , on 24–27 November 1998. The conference will be devoted to all aspects on theory, design, modeling, simulation, and applications of circuits and systems. Plenary sessions, special sessions, invited talks, and tutorials on specific advanced topics will also be included in the program. Lecture sessions and poster sessions will be treated equally in terms of review process. **"Microelectronics and Integration System"** is the theme of the conference.

**AUTHOR'S SCHEDULE:**
Extended summaries: April 15, 1998
Notification of acceptance: July 15, 1998
Camera-ready papers: September 15, 1998

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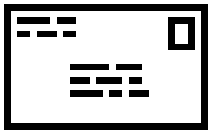
Thailand

# IEEE Circuits and Systems Society Newsletter

**Newsletter Homepage–http://www.nd.edu/~stjoseph/newscas**



## Letter to the Editor

In the December 1997 issue of the CAS Society Newsletter, editor Michael Sain's comment (regarding editing an IEEE Transactions) that "In those times it was absolutely crucial to know that the associate editors were out there and ready to help" got a chuckle from me.

When I inherited, from Mac Van Valkenburg in 1963, the job of editor of the *Transactions on Circuit Theory* (the only publication we then had), there was just an editor. Mac had already been feeling the need for help but had carried on alone for three years. Soon after taking the helm, I appointed the first associate editors of the *Transactions on Circuit Theory*: Nick DeClaris and Larry Huelsman. The rest, as they say, is history.

Carry on!

Norman Balabanian
(Emeritus from Syracuse University
Courtesy Professor, University of Florida)

## Awards/Fellow Web Site

IEEE Awards/Fellow Activities has launched a Web site, <www.ieee.org/awards>, to promote the IEEE Awards program, encourage nominations, and recognize recipients and sponsors. The site also helps meet one of the IEEE strategic goals—to increase the visibility of the IEEE Awards/Fellow program.

From the site, members can obtain forms and submit major award nominations via email. Members also can obtain Fellow Kits for the 1999 elections until March 15, 1998, but Fellow nomination forms must be submitted in hard copy by first-class mail or express carrier.

The debut of this site on the Web represents a massive effort by Awards/Fellow staffers Joan Muzzio and Sandy Schumacher with the help of Reginald Hands and Sandy McConville, both of Information Technology.

***—Marsha H. Longshore***
***IEEE Corporate Communications***

## Correction Notice:

In the December 1997 issue of CAS Newsletter, the nominations for next year's IEEE Fellows were announced. Unfortunately, the deadline for submission of the nominations has been changed and is incorrect in the Newsletter announcement.

**The deadline for submission of IEEE Fellows Nominations is March 15, 1998**, not April 15 as printed in the Newsletter.

IEEE Circuits and Systems Society Newsletter

**Editor:** Dr. Michael K. Sain
Electrical Engineering
University of Notre Dame
Notre Dame, IN 46556 USA

*NDES Workshops. . .continued from Page 15*

Of course, the successes of the NDES workshops have come about from the efforts and enthusiasm of the organizers, from the contributions of the participants, and the excellence of the venues. However, the supporting role of IEEE Circuits and Systems chapters and other entities in IEEE (in terms of time given, publicity and in many cases, finance) has been significant and important, and is a demonstration of the role which IEEE can play in Region 8 in promoting timely technical events in the region.

Most of the Circuits and Systems chapters referred to have been established within the last decade, some very recently, and show the success of Circuits and Systems Society and Region 8 initiatives to develop IEEE technical activities through the formation of and increased support for chapters in Region 8.

## *Society Officers*

Each year, members of the Board of Governors elect President-Elect, Vice Presidents for Administration, Publications, Technical Activities, Conferences, Region 8, Region 9, and Region 10. The CAS Bylaws have provision for nominations from Society members by written petition with at least 15 members' signatures, excluding students.

If you wish to nominate a member to any of the above CAS offices, then, after obtaining the consent of the nominee to serve if elected, please fax the name of the nominee, address, telephone, fax number, and e-mail address, if available, to the CAS Nominations Committee Chair on the form below. Officer nominations must be received by **September 1, 1998**. Send nominations to Professor Michael Lightner at the address on the form to the right.

**THE INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS, INC.**
445 HOES LANE
PISCATAWAY, NJ 08855

# CALL FOR NOMINATIONS

## *Board of Governors*

Each year, 5 members of the CAS Society are elected to the Board of Governors for 3-year terms. The Board of Governors shall represent the members of the Society and approve the Society's annual budget, amendments to the Constitution and Bylaws, and authorize the expenditure of Society funds. Members of the Board of Governors should not miss annual meetings (at ISCAS in May/June and ICCAD in November) more than 2 times consecutively. Nominations from the Society membership must include at least 15 signatures of Society members, excluding students. Upon receipt of nominations, the Nominations Committee will submit at least 11 candidates for Society-wide election of the five Board members.

If you wish to nominate a member to the Board of Governors, then, after obtaining the consent of the nominee to serve if elected, please fax the name of the nominee, address, telephone, fax number, and e-mail address, if available, to the CAS Nominations Committee Chair on the form below. Board of Governors nominations must be received by **June 1, 1998**. Send nominations to Professor Michael Lightner at the address on the form below.

### CAS NOMINATION FORM

***CAS Office:***

- ☐ Member of the Board of Governors
- ☐ President-Elect
- ☐ Vice President, Administration
- ☐ Vice President, Conferences
- ☐ Vice President, Publications
- ☐ Vice President, Technical Activities
- ☐ Vice President, Region 8
- ☐ Vice President, Region 9
- ☐ Vice President, Region 10
- ☐ **The Candidate has agreed to serve if elected; and 15 valid names and addresses (mail, phone, fax, email), with signatures, are attached!**

***Candidate:***

Name _____

Address _____

Phone _____ Fax _____

***Nominator:***

Name _____

Address _____

Phone _____ Fax _____

*Please mail or fax this form to:*
Michael Lightner, CAS Nominations Committee
University of Colorado
Department of Electrical & Electronic Engineering
Campus Box 425
Boulder, CO 80309
Tel. (303) 492–5180 Fax (303) 492–2758