

The Origin of the JOURNAL, the Council, and the Conference of Solid-State Circuits

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THIS JOURNAL, our much loved and greatly respected "red rag," will be a mere 18 years old this year of the IEEE Centennial—only a youth in the history of electronics and electronic applications. Nonetheless, it has become a most important journal for electronic workers of many types. Its origins and its growth are a very good indication of the vitality and growth of the IEEE itself and how it has identified the needs of its members and has adapted both organizationally and with new institutions to meet new needs.

Investigations in physical electronics, of course, precede the formation of the AIEE and the IRE, the predecessor-founding organizations of the IEEE. At about the time of the initiation, the Edison effect had been noted, probably by several investigators, occurring within thermionic bulbs with an extra electrode. Most electronics at that time was really concerned with the physics underlying electronics. Engineering electronics, in a sense, can be dated from 1896; in that year J. J. Thomson put the electron beam to work and developed the cathode-ray tube, one of our first and still most important engineering devices. In the same year, G. Marconi put electromagnetics to work and demonstrated wireless communications, i.e., radio.

Electronic circuits, as we know them today, can probably be dated from the work of Edwin Armstrong, especially from his development of regeneration in 1912. With the availability of DeForest's triode tube, developments in electronic circuits came fast, involving a whole gamut of signal processing functions—amplification, filtering, modulation, detection, and so forth. A major milestone was the development of the superheterodyne principle, again by Armstrong, in 1918. (He also developed the superregenerative receiver in 1924, and frequency modulation in the early '30s.) For what are now called digital (discrete-state) circuits, an important milestone was reached 1919 when Eccles and Jordan first published the details of their circuit for achieving two stable states—the famous Eccles/Jordan flip-flop. Descriptions of these new electronic circuits, of the functions they achieved, and the evaluation of how the function is achieved by the circuitry

oftentimes appeared in the publications of the predecessor organization, the IRE. In fact, as one looks at the PROCEEDINGS OF THE IRE of those early days, one can readily see the kinship which the JOURNAL OF SOLID-STATE CIRCUITS has with it.

Jumping ahead to the late '40s, and the invention of the transistor, one sees both similarities with the earlier developments and a significant difference. Many of the early developments of transistor electronics, i.e., solid-state electronics, did appear in the PROCEEDINGS OF THE IRE and the TRANSACTIONS of the various IRE Professional Groups (now Societies of the IEEE). But it must be recognized that within what is now the IEEE, the strong development of professional subentities, each with an area of expertise and each with distinct views of what was critical and important, had an inhibiting effect on new developments. It is true that within each of these early societies there were voices that said we must look at and emphasize new developments and new application areas. However, each Society was moving and expanding rapidly in its own right and most did not have the resources necessary to incorporate new research areas or to set up new publications.

By the early 1960's, distinct problems with respect to solid-state circuits were quite evident. In some Societies, there was a distinct feeling of threat by the growth of solid-state circuits. These Societies felt pressed to take over and control these new developments, not only to ensure orderly development, but also to protect their particular areas. Other Societies, although noting the competitive aspect, believed that they must work closely with this new topic and area in a complementary manner. On the other hand, there were Societies that were so involved with the burgeoning technology of their own field that they had difficulty attending to the problems that arose with solid-state circuits; it was the hope that somebody else would take care of the nurturing of this area. And, finally, within one society the internal stresses mentioned above led to the realization that something must be done with regard to adequate publication and that it undoubtedly could not be done within their own publications. A new publication appeared to be essential.

In 1954, there emerged the forerunner of the very important conference, the International Solid-State Circuits Conference. The ISSCC emerged because of a new committee and the explosive desire for people to participate in its

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deliberations. This committee was the so-called Four-Ten (4.10) Committee. In those days of the IRE, one of the standing committees was Committee Four, which dealt with all aspects of radio circuits. Within Committee Four there were numerous subcommittees dealing with topics such as standards. Several members of the IRE felt that it would be appropriate to have a committee that would coordinate aspects of solid-state circuits. Thus, the Four-Ten Committee was formed, holding its first meeting in 1953 in Connecticut. Out of the first meeting came the conclusion that a new conference should be held in which participants could present and hear papers in this new field of solid-state circuits. With the sponsorship of the University of Pennsylvania, the Pennsylvania Section of the IRE, the IRE Professional Group on Circuit Theory, and the Four-Ten Committee, the first IRE-AIEE Conference on Transistor Circuits was held and was inundated with an unexpected 600 attendees. The Chairman of this first conference of what was to become the ISSCC was Irving Wolfe and the first Technical Program Chairman was John Linvill.

The ISSCC has now celebrated its 30th anniversary and without question is one of the most dynamic and most important conferences sponsored by the IEEE and its constituent elements. An important factor in its success has been the availability at the Conference of the *Digest of Technical Papers*. The *Digest* is now a leading, important publication in its own right, due to the superb contributions of Lew Winner. Histories of the Conferences and the *Digest of Technical Papers* appeared in the *Digests* of 1978 and 1982.

About the time of the merger of the AIEE and the IRE in 1963, principal people involved with the technical aspects of the ISSCC, viz. a succession of the Technical Program and the General Program Chairmen, became aware of the severe publication problem. Here was a premier conference, yet there was no archival journal for this field. There was not a suitable journal within the IEEE in which full-length papers on the topics of the conference presentations could be made. It was evident that these papers were not being published in major journals. If published at all, these papers were in nonarchival trade journals. Thus, several of the key players in the formation of the JOURNAL OF SOLID-STATE CIRCUITS and the Solid-State Circuits Council came from ISSCC.

Several Societies or Groups of the IEEE were worried about this publication problem and some had started to take action with respect to the formation of a new journal. However, at this time, another technical coordination problem had arisen that had initiated action within the IEEE. The Technical Activities Board (TAB) of the Institute under the guidance of Richard Emberson proposed that a "Council" be formed to coordinate the intersociety aspect of the new field of quantum electronics. The Quantum Electronics Council was established with membership from interested Groups and Societies within the IEEE. Following this precedent, and as proposals for new journals emerged from other Societies, a key ad-hoc committee of TAB was formed under the chairmanship of James Mulligan. Out of

the deliberations came the proposal to form the Solid-State Circuits Council. The four founding societies of the Council were, in alphabetical order, the Circuits and Systems Society, the Computer Society, the Electron Devices Society, and the Microwave Theory and Techniques Society. Each of these Societies nominated two of its members to serve as representatives on the Solid-State Circuits Council. A new aspect for this Council was its mandate to originate and to manage a new journal; the JOURNAL OF SOLID-STATE CIRCUITS. The Council was given the responsibility of setting policy for the new journal, of establishing publication standards and formats, of choosing the Editor, of working with him to establish a team of Associate Editors and to coordinate the work of this editorial group with ISSCC.

From the beginning, a decision was made that a major source of papers for the JSSC should be the full-length versions of papers first presented at the ISSCC. However, this aspect took time. Many of the conference speakers at the ISSCC were not accustomed to publishing in refereed, scholarly publications. After the vigorous refereeing and selection process for paper presentation at the ISSCC, it was necessary to work rather carefully with the prospective authors to encourage them for further effort to achieve the results for adequate publication in a major journal of the IEEE. The first Editor, James Meindl, then of the U.S. Army Electronics Command and now of Stanford University, had to be very diligent in his search for both adequate quantity and quality of papers for his first issues. The first issue was in September 1966. It is important to acknowledge the support given Meindl and his publication efforts by the U.S. Army. This support was essential in launching the new journal.

Dr. Meindl, as the first Editor, made significant contributions, not only in working with the authors to publish their good contributions in spite of the press of their dealing on a daily basis with the exploding technology of solid-state circuits and devices. In addition he set the tone of the JOURNAL OF SOLID-STATE CIRCUITS. In short order, he was able to achieve a high standard of quality and was able to establish a pattern of publishing major ISSCC presentations as regular title papers, with the support and assistance of the Solid-State Circuits Council and the committees of the ISSCC. The tradition was definitely established of good papers in this field being published in the Journal. As the Journal moved to bimonthly rather than quarterly publication, special issues were authorized and encouraged concerning principal topics of the presentations of the ISSCC, such as Digital Logic and Memory, Analog Circuits, and so forth. After five years, Professor Meindl stepped down as the Editor and was followed by Professor David Hodges. Hodges continued the developments established by Meindl and brought in his own talents to establish the orderly organization of reviewers and special issues. After these two Editors it was clear that the JOURNAL had already become a major publication; it was here to stay. The succession of Editors for the JOURNAL is shown in Table I. Each Editor has been excellent in running the JOURNAL, in establishing new directions, tak-

TABLE I
EDITORS OF THE JSSC

JAMES D. MEINDL
DAVID A. HODGES
LEWIS M. TERMAN
PAUL R. GRAY
GARY L. BALDWIN
W. DAVID PRICER

ing initiative in developing new ideas, and continuing to enhance the quality of this publication. There have been many Associate Editors who have contributed greatly of their time. The organizations with whom the editorial staff are affiliated have been active supporters, permitting time and giving support for this professional effort.

A few years after the establishment of the Council and the JOURNAL, new IEEE policies were established with regard to conferences. In the present case, it was decided that the International Solid-State Circuits Conference, as an important conference, should be governed by a standing body of the IEEE. For the ISSCC, the Solid-State Circuits Council was the logical choice, replacing the more loosely coupled, informal Sponsors' Committee. Nonetheless, the Sponsors' Committee of the ISSCC was retained for a lengthy time; however, within this committee were now representatives from the Solid-State Circuits Council together with the representatives from the Philadelphia Section and the University of Pennsylvania. This group took the active role in overseeing an administrative office for the ISSCC. A critical person in the Sponsors' Committee from the very beginning was Murlan Corrington of RCA. Up until his retirement, he was a dominant, albeit a quiet and unobtrusive, person who insisted on the proper development and operation of a superb conference.

With the growth of solid-state electronics on the West Coast, it became clear that it was time to think in terms of other locations for the ISSCC. After lengthy studies, a trial conference location at San Francisco was proposed for the 1978 conference. The conference in San Francisco was a resounding success with near-record attendance. The conclusion of the Sponsors' Committee and the Council was that the ISSCC should alternate between the East and West Coasts. This in turn lead to a change in the constituency of the Sponsors' Committee. The University of Pennsylvania dropped out of active involvement, and the IEEE Section involved depended upon the location of the Conference. In 1976, the Sponsors' Committee was changed to the Executive Committee of the Conference, the Chairman of which is appointed by the Solid-State Circuits Council.

Thus, we arrive at today. The JOURNAL OF SOLID-STATE CIRCUITS is a healthy dominant force in the technical area of solid-state circuits. Its parent, the Solid-State Circuits Council, has lived up to all expectations of its first Chairman, Professor John Linvill. Table II shows the names of the succession of excellent Council Chairmen. The Council has expanded over the years to include other IEEE Societies as their interest has encompassed solid-state circuits. The present membership of the Council is shown in Table III. The Council truly has become a body by which the

TABLE II
CHAIRMEN/PRESIDENTS OF THE SSCC

J. G. LINVILL
G. E. MOORE
F. H. BLECHER
J. D. MEINDL
J. A. A. RAPER
R. R. WEBSTER
D. A. HODGES
M. R. BARBER
W. J. SPENCER
W. D. PRICER
R. G. MEYER
F. K. BUELOW

TABLE III
IEEE SOCIETIES AFFILIATED WITH THE SSCC

Circuits and Systems
Communications
Components, Hybrids, and Manufacturing Technology
Computer
Electron Devices
Microwave Theory and Techniques
Quantum Electronics and Applications
Sonics and Ultrasonics

interested societies can participate successfully without competition. Its conference, the ISSCC, continues in its path-breaking role.

ACKNOWLEDGMENT

In the early days, the ISSCC, or its forebearer, was always held in the city of Philadelphia. Thus, the older of us still refer to the Conference as "Philly." We go with pleasure to "Philly" in February no matter where the Conference is being held. It has been my pleasure to think back to the origins of the "red rag," the Council, and to Philly. I have been aided in my remembrances in talks with Dave Hodges, John Linvill, Jim Meindl, Jim Mulligan, Dave Pricer, and Mac Van Valkenburg. They have been helped by conversations with Dick Emberson and Murlan Corrington. To all, I am pleased to acknowledge their suggestions and input. If I have twisted a fact or two, I alone take responsibility.



Donald O. Pederson (S'49-A'51-M'56-F'64) received the B.S. degree from North Dakota State University, Fargo, in 1948, and the M.S. and Ph.D. degrees from Stanford University, Stanford, CA, in 1949 and 1951, respectively.

From 1951 to 1953, he was a Research Associate with the Electronics Research Laboratory, Stanford University. He worked at Bell Telephone Laboratories and was also a lecturer at the New Jersey Institute of Technology from 1953 to 1955. In 1955 he joined the University of California, Berkeley.

He is now a Professor with the Department of Electrical Engineering and Computer Sciences, engaged in research in integrated circuits and computer-aided integrated circuit design, and is the Chairman of the Department. From 1960-1964, he was Director of the Electronics Research Laboratory.

Dr. Pederson is a member of Sigma Xi and Eta Kappa Nu. In 1964 he was a Guggenheim Fellow. He was the recipient of the 1969 IEEE Education Medal. In 1974 he was elected to the National Academy of Engineering. He was awarded an honorary Doctor of Applied Science by the Katholieke Universiteit, Leuven, Belgium, in 1979. In 1982 he was elected to the National Academy of Sciences.