

Scanning the PROCEEDINGS for History

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By some measures, the May 1912 merger of the Society of Wireless Telegraph Engineers and the Wireless Institute to form the Institute of Radio Engineers (IRE) does not seem to have been an auspicious event. The two merging societies had themselves been formed only a few years earlier, driven by the desire of communications (wireless) engineers to have a professional home of their own, a home distinct from the American Institute of Electrical Engineers (AIEE), which was increasingly focused on electric power. But two societies for wireless engineers were apparently not needed, and perhaps not yet even one. The initial membership of the IRE was reported to be “fewer than fifty.”

Robert H. Marriott, the founding President of the Wireless Institute became the founding President of the IRE. Evidently, he and the other IRE founding fathers recognized that a publication would be central to the success of the new organization, and in January 1913, they launched the PROCEEDINGS OF THE INSTITUTE OF RADIO ENGINEERS, the journal that 50 years later would become the PROCEEDINGS OF THE IEEE. Alfred N. Goldsmith was appointed the first Editor. As a graduate student at Columbia University, Goldsmith had been responsible for the publications of the Wireless Institute. The cover of the first issue indicates that he had, by 1913, received a Ph.D.

Much has been written about the history of the PROCEEDINGS OF THE IRE/IEEE and of the history of technology it records; anything more is almost certain to be redundant. But the magic of IEEE Xplore now makes it practical for all of us to be casual historians, to easily read through a century of original publications in our field, to see for ourselves how world changing innovations began in the context of their time. What follows are some notes and observations from my own scan through the archive. I urge you to try it for yourself. I think you will be as fascinated as I have been.

For a society of so few members, the first issue was impressive. In the first paper, Michael I. Pupin described theoretical work aimed at understanding the radiation properties of antennas. Pupin, a “Professor of Electro-Mechanics” at Columbia University (note the implied interdisciplinary nature of the position), was then famous as the inventor of loading coils, inductors, that when properly spaced along telephone lines allowed much longer transmission.

The second paper, by Stanley M. Hills, is a description of the properties of high-voltage (high-tension) insulators for communications. It is a very practical paper, seemingly aimed at what we might today call the “practicing engineer.” The paper does not carry Hills’ affiliation and I have learned little about his career. But 84 years later (*Proc. IEEE*, vol. 85, pp. 311–113, 1997), J. Keith Nelson, a current member of the IEEE Board of Directors and an expert in the field, lauded it as “visionary.”

The third and final paper was by Lee de Forest, inventor of what he called the audion, later known as the triode vacuum tube, an amplifier that enabled wireless audio transmission. De Forest gives his affiliation as “Engineer of the Federal Telegraph Company,” and writes about the technologies used by that company.

Each of these papers was followed by comments from the editor and others, in a manner familiar to readers of today’s blogs.

Pupin (1917), Goldsmith (1928), and de Forest (1930) were all future Presidents of the IRE.

In Volume 1, Issue 2, which was published about a year after the loss of the Titanic, Robert Marriott wrote about “Radio operation by steamship companies.” In it, he argued that shipboard wireless equipment and the training of their operators were both well behind the state of the art of the time, and he called for improvements in both. It is a strong early example of engineers engaging in discussions of public policy related to technology.

A total of 15 papers were published that first year, in quarterly issues priced at \$1 each.

Today, as we debate the future of technical publishing, of copyright, and of open access, it is interesting to read the original republication policy of the IRE:

“The right to reprint limited portions or abstracts of the articles, editorial notes, or discussions in the PROCEEDINGS, is granted on the express

condition that specific reference shall be made to the source of such material. Diagrams or photographs in the Proceedings may not be reproduced without securing permission to do so from the Institute thru the Editor."

If you prefer to be guided through the history reported in the first quarter-century of the PROCEEDINGS, read a much later historical piece by James E. Brittain (*Proc. IEEE*, vol. 84, pp. 1747–1772, 1996). This period saw the development and widespread use of vacuum tubes, the shift from long-wave to short-wave communications, development of commercial radio broadcasting, and early experiments with television and microwave systems.

Volume 25, Issue 1 (January 1937) gives us some insights into the development of the IRE over its first quarter century. On a page of "General Information," we learn that, in addition to its office in New York City, there was a publications office in Menasha, WI. The volume of publication had grown to about 100 papers per year. Each issue was mailed to all members as part of their member benefits; others paid \$10 per year. Membership was described as "several thousand," and the "Aims and Objects" of the Institute were stated as follows:

"The Institute functions solely to advance the theory and practice of radio and allied branches of engineering and of the related arts and sciences, their application to human needs, and the maintenance of a high professional standing among its members. Among the methods of accomplishing this is the publication of papers, discussions, and communications of interest to the membership."

The same issue reports that 20 local Sections had been organized, all

but two (San Francisco and Seattle) east of the Mississippi, and all but two (Montreal and Toronto) in the United States.

Volume 50 (1962), the final volume of the PROCEEDINGS OF THE IRE, included about 600 papers, and showed the continued growth of the organization. In Issue 12, Patrick Haggerty, the 50th and final President of the IRE, wrote:

"All of us, in working for the establishment of the IEEE, have done so with a single aim—to bring into being a professional society superior to either of its component parts. IRE has been an excellent organization, and it has served its members well, but we, the members of IRE, are joining with the members of AIEE so that we may have an improved institute even better able to serve our profession and the greater society of which we are all a part."

A second historical paper by James E. Brittain can guide you through the major developments of the IRE's second quarter-century (*Proc. IEEE*, vol. 85, pp. 762–797, 1997). This was the era of the development of radar systems and, after World War II, television, computers, and the transistor, all of which were prominently covered.

With the merger of AIEE and IRE in 1963, the new IEEE had a membership of about 150 000 in about 150 local Sections, but was still primarily a North American organization. The PROCEEDINGS OF THE IRE became the PROCEEDINGS OF THE IEEE, and the volume numbers continued, with Volume 51. The number of papers published per year nearly doubled.

In his editorials ("Poles and zeros") in the first few issues of Volume 51, Editor John D. Ryder celebrated the merger and reflected, sometimes lightheartedly, on decisions made and yet to be made. Why did not "American" appear in the new name? Because the founders expected

IEEE to become an international organization. Aren't "Electrical" and "Electronics" somewhat redundant? Perhaps, but IEE was already taken. Why is there an "s" on "Electronics?" Because, though older branches of learning commonly end in "ic," (music, logic, arithmetic), newer branches end in "ics" (physics, economics, mathematics). Why are there no letters on the logo? Because it should be as familiar to speakers of Chinese, Russian, or Arabic as to those who use a Latin alphabet.

The first issue of Volume 51 was a Special Issue on Quantum Electronics, not power (AIEE) and not yet communications (IRE), but a clear demonstration that IEEE could, through its publications, play an important role in defining new disciplines of technology. The issue arrived less than three years after the demonstration of the first laser, before the enduring textbooks in this field were written. To those of us in the field, it became a *de facto* textbook on lasers and related topics. I still have my copy.

Responding to the value that readers found in them, the editors increased the number of special issues and special sections dramatically over the next 25 years, as the field of electronics diversified.

Your guide to the technical trends of the third quarter-century of the PROCEEDINGS (1963–1987), if you want one, is a 2005 paper by Ronald Kline (*Proc. IEEE*, vol. 93, pp. 2170–2187, 2005). It chronicles the dramatic growth and diversification in electronics in the post-Sputnik era, an era in which electronic devices shrank dramatically, the communications spectrum expanded from the microwave region to the visible, and computers and digital systems became widespread, not just for computation but also for control.

In addition to the three historical guides cited above, each of this year's issues of the PROCEEDINGS contains an article by the staff of the IEEE History Center describing, decade by decade, the important technological advances of the past century and highlighting

some of the more significant papers during those periods.

Today, the growth in volume of papers has slowed as the number of more narrowly defined IEEE journal titles has grown, but the PROCEEDINGS OF THE IEEE remains vibrant and it is *the* place to find definitive

papers of broad interest in electrical and electronics engineering. In 2011, about 1650 papers were published in the PROCEEDINGS. Its impact factor, based on citations, is consistently near the top of the list of journals in electronics and electrical engineering and about 800 000 articles from the

PROCEEDINGS are downloaded each year.

I congratulate Editor-in-Chief Robert J. Trew, Managing Editor Jim Calder, the Editorial Board, and the PROCEEDINGS Staff on their contributions to the PROCEEDINGS and for the celebration they have planned. ■