

Jim Brittain and the Allure of Electrical History

By ALEXANDER B. MAGOUN

I. INTRODUCTION

James E. “Jim” Brittain, Fellow of the IEEE, Professor Emeritus at Georgia Institute of Technology, and founder of the “Scanning Our Past” section of this journal, died March 3, 2018, not far from where he grew up in Henderson County, NC, USA. Well trained and educated to pursue a terminal degree in electrical engineering in the 1960s, the soft-spoken Brittain made the astonishing career change to history, with significant consequences for the history of IEEE and IEEE technologies. This article draws largely on Brittain’s documented, unpublished memoir to explore aspects of his background and career that successfully fed what he called “the increase and diffusion of knowledge about the contributions of electrical engineers.”¹

This article presents how an electrical engineer of humble origins turned into a historian and persuaded IEEE to preserve and promote its history.

II. RURAL CHILDHOOD, 1931–1949

Born on May 20, 1931 to Velma and Randall Brittain in his parents’ farmhouse on what is now called Brittain Place in the foothills of western North Carolina, Brittain grew up during the Great Depression in a Mills River household without electricity or indoor plumbing. The J. C. Carland Grist Mill that a neighbor once took him to visit as a child was water-powered, and the family traveled locally on dirt roads by foot or horse and wagon. Getting to Moore’s general store meant taking a trail over the wooded ridge behind the house. When the family divided its property in 1936, his father and a neighbor set up a mobile sawmill on the North Mills River to prepare the timbers they assembled into a new house. Randall piped spring water into the house to give the family running water that also chilled a dairy room where Vera stored milk, butter, eggs, and the occasional rainbow trout. Brittain and his younger brother caught the fish as well as squirrels, rabbits, and fish for the dinner table, and muskrats whose

pelts they sold by mail to Sears, Roebuck and Company’s Raw Fur Marketing Service.² Getting to the new house meant fording the river “just below the big rock” or crossing it on a milled log into the early 1950s. Until he started traveling 8 km to the public Mills River School by bus in fall 1937, Brittain and his family lived a preindustrial existence in many respects, one that replicated the lives of generations of farming Brittains before him in Henderson County (Fig. 1).

Opened in 1913, the Mills River School consisted of a two-story building for all students in grades 1–11 until 1943, when high school students were moved to a new building next door. Brittain was first to master the multiplication table in the third grade, and his seventh-grade teacher Bessie Jordan encouraged him to be confident in his intelligence and to memorize the squares through 25, which became useful much later in his engineering career. Despite the school’s small size, Brittain took two years of Latin, learned enough chemistry to find that the college version was “rather easy,” and enough physics to qualify for the U.S. Air Force’s (USAF) radar school (Fig. 2).

¹J. E. Brittain, “Scanning my past: An autobiography,” unpublished typescript, 2007, p. 102. Courtesy of J. A. Brittain and J. Brittain. Quotes without references are from this source.

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²H. Metzger. *Conservation at the Confluence*. Accessed: Nov. 26, 2017. [Online]. Available: <http://www.blueridgenow.com/news/20171126/conservation-at-confluence>, T. Parr. *Antique Traps: Sears Tips for Trappers*. Accessed: Feb. 5, 2019. http://www.furfishgame.com/featured_articles/Archived/2014/2014-05/antique_traps_05-2014.php

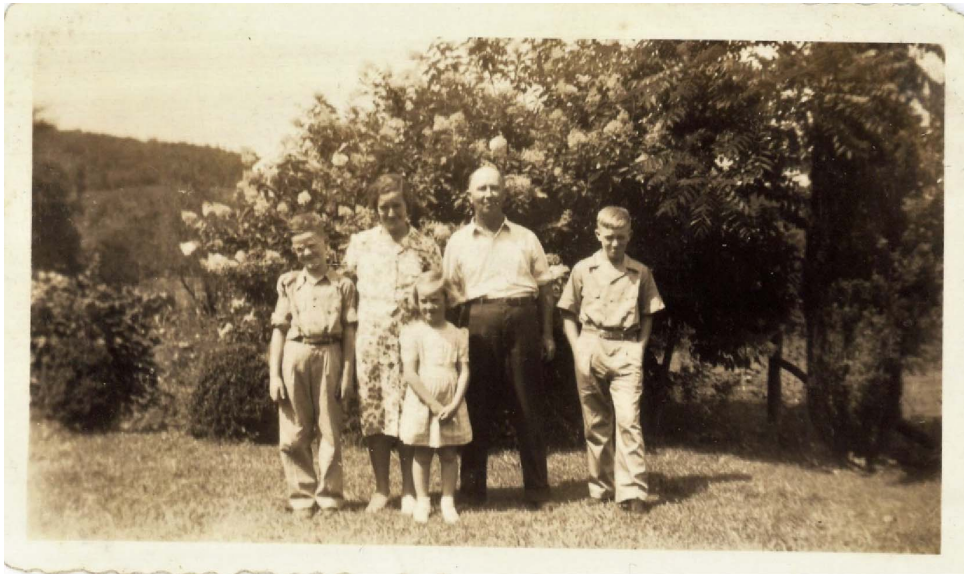


Fig. 1. Brittain family, Mills River, NC, USA, c. 1945: Jere, Velma, JoAn, Randall, and James. Courtesy Jo Ann and Jere Brittain.

III. AIR FORCE EDUCATION, 1950–1954

The military was the alternative to the family farm, for when he graduated at the head of his class of 26 students in 1949, no one could tell Brittain how to pay for college. Instead, after a summer as a farm laborer, he traveled 21 km to Hendersonville, the county seat of 6100 in 1950, to enlist in the U.S. Air Force in January 1950. The recruiting sergeant drove Brittain out of his county for the first time, over 2 h to the thriving city of Charlotte,

population 134 000, where the USAF put him on trains to Lackland Air Force Base (AFB) in San Antonio, TX, USA. During basic training, testing revealed Brittain's aptitudes for electronics and radar operation. In May, one month before North Korea invaded the U.S. ally South Korea, he began a 42-week course in radar fundamentals at Keesler AFB in Biloxi, MS, USA. This culminated in intensive study of the APN-9, APQ-13, and APG-15 radars used on the B-29, the Air Force's primary four-engine bomber. Brittain received a superior rating, promotion to corporal, and assignment to teach the course he had just finished in January 1951. As he observed, "It had taken about a year of my life to make the transition from farm boy to a radar specialist in the 'high technology' of 1950. . . . [T]he rest of my professional life was to be spent as a student or teacher."

That he became an instructor for the Air Training Command (ATC) at 19 was a result of the onset of the Korean War. The ATC certified 82 000 technicians in 1950, up from 48 000 the year before, but the quality of those additional staff declined as an ATC history states: "Immature and inexperienced instructors produced inadequate graduates, some of whom were retained as instructors to produce graduates of still less ability."³ Brittain was one of the exceptions. He passed an instructor training course and embraced teaching men his age through block and circuit diagrams, intentional malfunctions, and multiple-choice quizzes indexed for difficulty and validity. First came the operation and intricacies of the AN/APN-9 Loran navigation receiver and the APG-15 gunlaying radar for the B-29's tail guns before Brittain progressed to the high-powered APQ-13 bombing radar, which "would cause a

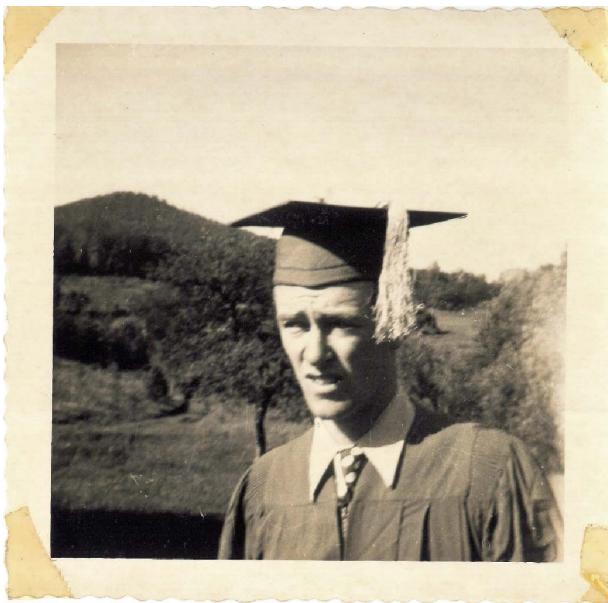


Fig. 2. Mills River High School valedictorian James E. Brittain, with Brittain Ridge in the background, June 1949. Courtesy Jo Ann and Jere Brittain.

³R. B. Sligh, *Air Training Command and the Korean War*. Randolph, TX, USA: Univ. City Randolph AFB, 2003, p. 28.

fluorescent light to glow when the antenna pointed toward it in the classroom.”

After a year, Brittain graduated on to the APR-8 and APT-16 electronic countermeasure (ECM) units, where the ATC’s inability to scale up for teaching more complex technologies became more apparent. Promoted to sergeant late in 1951, he was certified after a three-month course in the maintenance of 17 different ECM sets, “even though my contact with some of them had been superficial at best. . . . [A]t least one came with only a schematic diagram.” Some of them required a Secret clearance that Brittain obtained “more or less after the fact.” There was little consolation in the fact that “no one at Keesler seemed to know much more than I did” about the units’ features.

A delay in the opening of an ATC school in ECM resulted in Brittain’s temporary assignments to write technical manuals for the future course and then to a Strategic Air Command base in Roswell, NM, USA. He spent a month installing and removing countermeasure equipment in B-50 bombers for test flights, catching the flash of an atomic bomb test north of the base, before returning to Mississippi and receiving seemingly random assignments in further electronic equipment training and education (Fig. 3). As the end of his four-year enlistment approached, filled with the confidence of technical expertise, Brittain drew on the Government Issue Bill’s \$110 per month for military veterans to underwrite his bachelor’s degree in electrical engineering at Clemson A&M College (now Clemson University), in South Carolina, where he matriculated in February 1954.

IV. STUDENT AND TEACHER OF ELECTRICAL ENGINEERING, 1954–1959

Electrical engineering at Clemson began with a year of courses to ensure that students knew something of the profession’s long tradition of problem solving, and how to make a variety of metal objects. Brittain received his only B grades in engineering drawing and a shop course where students destined to work on power lines, transformers, and electronics learned how to cast molten iron in sand molds, arc-weld, and forge iron. The head of mechanical engineering, Bernhard “Uncle Benny” Fernow, in course on thermodynamics, “Fernow’s Inferno,” had Brittain and his classmates run indicator diagrams on a Corliss reciprocating steam engine while they internalized the seven basic rules of his “Habit Schedule.” For example, “whenever possible, state the problem graphically. Make a diagram showing the system involved and put the data where it belongs on the diagram.”

As an upper classman, Brittain joined the student branches of both the American Institute of Electrical Engineers (AIEE) and the Institute of Radio Engineers (IRE), and finally immersed himself in circuit analysis, dc and ac machines, and electron tube electronics, “although there was a little on transistors near the end of the text book.” He encountered an analog computer that showed the



Fig. 3. Sergeant James E. Brittain, United States Air Force, holds the sign for his advanced airborne equipment class at Keesler AFB, MS, USA, September 1952. Courtesy Jo Ann and Jere Brittain.

solutions to differential equations on a cathode-ray tube. Despite his share of physics and mathematics, Brittain found little of James Clerk Maxwell’s electromagnetic theory, to his disappointment. On the other hand, despite the demands of his major, Brittain took additional courses in history and literature “because I enjoyed them as a change of pace from technical courses.” He graduated with highest honors in 1957 and promptly enrolled in the Master’s program for electrical engineering at the University of Tennessee. That October, the orbit of Sputnik I finally moved the U.S. Congress in 1958 to pass the National Defense Education Act (NDEA), whose loans and fellowships underwrote the technical education of thousands of Americans, including Brittain’s.

In the coursework, Brittain endured department head Paul Cromwell’s use of Oliver Heaviside’s operational calculus, which “seemed oddly outdated” for one who had learned to use Laplace transforms at Clemson.⁴ In electronics, J. Frank Pierce finally introduced Brittain to transistors, easing analysis through the use of hybrid parameters in equivalent circuits.⁵ James D. Tillman, a pioneer

⁴For a 1992 argument on behalf of the advantages of Heaviside’s operational calculus, see P. A. Kullstam, “Heaviside’s operational calculus applied to electrical circuit problems,” *IEEE Trans. Educ.*, vol. 35, no. 4, pp. 266–277, Nov. 1992.

⁵For a history of the representation of transistor circuits, see R. L. Pritchard, “Transistor equivalent circuits,” *Proc. IEEE*, vol. 86, no. 1, pp. 150–162, Jan. 1998.

in circular antenna arrays, unpacked antenna theory and supervised Brittain's Air Force-sponsored research on electronically steerable antennas on Dickinson's Island east of Knoxville in the Tennessee River. The USAF made permanent his Secret clearance from Keesler AFB after which Brittain authored interim research reports, traveled with Tillman to the Air Force Cambridge Research Laboratories in Massachusetts, and presented a paper on folded monopole antennas to the Tennessee Academy of Sciences.

As he was completing his master's in spring 1959, Clemson invited Brittain to return as an assistant professor. Rooming in a widow's house and dining at Mrs. Newman's boarding house, he spent most of his time that fall in Riggs Hall, preparing and conducting three lecture classes in advanced electronics and advanced circuit theory and two accompanying labs. During the spring term, Brittain was finally able to indulge his appreciation for Maxwell's equations, "which I soon became expert on." He taught up to 75 students per semester, not including Southern Bell Telephone technicians on two-week refresher courses, and chaired four committees for M.S. candidates.

V. BRITTAIN'S HISTORICAL TURN

One might date Brittain's interest in the history of his field with a question from one of the Bell students about loading coils. He found a transcript of the patent interference proceedings between George Campbell of AT&T and Michael Pupin of Columbia University in Clemson's library,⁶ which ultimately led to his master's thesis and a prize-winning article.⁷ His first article, "Saints of Science," however, was published in the Electrical Engineering Department's student magazine, *Slip Stick*, in May 1963. Brittain followed with a translation of M. L. Thevenin's theorem of circuit analysis in 1965,⁸ by which time he had begun interjecting historical anecdotes into his lectures and teaching a history course for graduate students, and he had attended a National Science Foundation Institute on the history and philosophy of science in summer 1964.

Brittain turned 35 in May 1965, when he decided that he "needed to get out of the rut and try something new in the second half of my life." Declining to pursue a Ph.D. at the University of New Hampshire in electrical engineering, to the surprise of family, friends, and colleagues, he decided to use his unmarried independence to embark on a three-year NDEA graduate fellowship in the new

⁶U.S. Patent Office Interference No. 20,699. Loaded Lines. G. A. Campbell, Application Filed Mar. 5, 1900, Serial No. 7281, v. M. I. Pupin, Patent issued Jun. 19, 1900, No. 652,230, Application Filed Dec. 14, 1899, Serial No. 740,238, Interference declared Aug. 22, 1900 (Boston, MA, USA: 1902).

⁷J. E. Brittain, "The introduction of the loading coil: George A. Campbell and Michael I. Pupin," *Technol. Culture*, vol. 11, no. 1, pp. 36–57, Jan. 1970. Won the Society for the History of Technology's Abbott Payson Usher Award in 1971.

⁸*Slip Stick* appears to be available only in Clemson's library; see J. E. Brittain, "Thevenin's theorem," *IEEE Spectr.*, vol. 27, no. 3, p. 42, Mar. 1990.

field of the history of technology at the Case Institute of Technology in Cleveland, OH, USA. The combination of his engineering background with a doctorate in history might enable him to "make more of a contribution than seemed possible if I continued to teach at Clemson."

By spring 1969, as the oldest student in the program, Brittain had taken a wide array of seminars on both the modern histories of science and technology, passed reading exams in French and German, and written master's and Ph.D. theses under Edwin Layton. While researching potential dissertation topics, he met George Southworth, microwave pioneer at AT&T's Bell Laboratories, and MIT's Radiation Laboratories microwave expert Edward Bowles, which would prove useful in later publications. In March, he accepted an assistant professorship in the Social Sciences Department at Georgia Institute of Technology for \$10 000 per year and defended his doctoral thesis on "B. A. Behrend and the Beginnings of Electrical Engineering, 1870–1920" during the summer.

Over the next four years, struggling with family medical issues, Brittain "tried to bury myself in work." Of the greatest significance in the long term was a paper delivered at the Society for the History of Technology (SHOT) meeting in 1970 "that may have led to an invitation to give a lecture at the Smithsonian [Institution]." During his visit in April 1971, he met Bernard "Barney" Finn, the curator of the Division of Electricity and Modern Physics, for a long conversation that initiated discussions on how to promote interest in history at IEEE. Brittain followed up with a letter reviewing possibilities of reaching the "invisible college" of electrical history devotees with a newsletter, a periodical, and a history session at the IEEE or SHOT annual meetings.

VI. IEEE HISTORY BEFORE 1972

History initiatives at IEEE and its predecessor organizations, the AIEE and IRE, had a long history. In 1906, as the United Engineering Societies building in New York City opened, the AIEE began acquiring "models of inventions and patents as may be of undoubted scientific or historic value," but its Historical Museum Committee failed to install exhibits in the museum space provided. During the early 1930s, with an eye on the AIEE's golden anniversary in 1934, president Charles Skinner proposed the writing of "a comprehensive history of the Institute and of electrical engineering." This became entangled, however, in a more ambitious proposal by the American Society of Mechanical Engineers (ASME) to create a national society of engineering history; the result was that neither project was approved. A 1949 proposal for an AIEE electrical engineering history committee by Electronic Numerical Integrator and Computer pioneer John Brainerd also came to naught.⁹

⁹A. Butrica, in consultation with S. Hochheiser, "The history behind the History," in *A History of Life Membership and the IEEE Life Members Committee History*, 2015. Accessed: Feb. 12, 2019. [Online]. Available: https://ethw.org/IEEE_Life_Members_Committee_History#The_History_Behind_the_History

That same year, in response to IRE past president Benjamin Shackelford's call for a history of the organization, the IRE Executive Committee appointed a committee of two, co-founder Alfred Goldsmith and past president Haraden Pratt, to research the proposal. They began analyzing the format of such a publication, its distribution, and the costs involved just as Columbia University's new Oral History Project invited the IRE to help underwrite its "Radio Pioneers" interviews. Interest in funding this, in part as a means of acquiring source material for the IRE history, hindered funding for a History Committee, just as the ASME overture sank the AIEE initiative 20 years before. Nonetheless, it appeared increasingly necessary to manage and coordinate the range of relevant initiatives, including the issue of preserving artifacts relevant to the IRE, documenting its members' careers, and recognizing the roles of IRE members in shaping the world's history. Pratt became chair of a small, board-approved History Committee in 1953. Lacking funding or staff support, the committee served largely as a consultant on artifact donations to the Smithsonian Institution, the development of the Smithsonian's communications exhibit in 1957, and the planning for the Division of Electricity at the Smithsonian's Museum of History and Technology, which opened in 1964.¹⁰

With the merger of the AIEE and IRE in 1963, Pratt continued as the chair of IEEE's History Committee until his death in 1969. Four years later, he also became a member of the IEEE Life Member Fund Committee (LMFC), which was in the midst of a conflict over funding travel to international standards meetings. A year later Pratt, presumably supported by fellow member and history proponent John Brainerd, made a strong proposal that the LMFC support the "compilation of a technological history of important events in the communications, electronics, and electrical engineering fields." With Pratt's more detailed proposal for a display case in the New York City office and unexpended monies intended for standards travel, the LMFC began funding the History Committee's initiatives.¹¹

VII. ADVOCATING FOR AN IEEE CENTER FOR THE HISTORY OF ELECTRICAL ENGINEERING

As the History Committee rose in status, so did its size. In 1971, Finn was recruited as the first historian and non-IEEE member, in a "consultant" role.¹² He had been

¹⁰Idem, *IRE History Committee*. Accessed: Feb. 12, 2019. [Online]. Available: https://ethw.org/IEEE_Life_Members_Committee_History#IRE_History_Committee

¹¹Idem, *History Meets the Life Members*. [Online]. Available: https://ethw.org/IEEE_Life_Members_Committee_History#History_Meets_the_Life_Members and *International Standards: The LMFC Gets Involved*. Accessed Feb. 12, 2019. [Online]. Available: https://ethw.org/IEEE_Life_Members_Committee_History#The_LMFC_Gets_Involved

¹²"History committee," in *IEEE Nominations and Appointments Committee History of Service Manual 1963–2013*. Piscataway, NJ, USA, 2013, p. 56. Accessed: Feb. 12, 2019. [Online]. Available: https://ethw.org/w/images/1/14/N-A_History_of_Service_manual.pdf

corresponding with Pratt since 1964, shortly after Finn's promotion at the Smithsonian to associate curator of the electrical collections. It "was very difficult" compared to working with Smithsonian curators and historians: "In those days, we met at the time of the annual meeting. . . . They were all engineers on the Committee, they were deeply involved in the Society, and we would meet at the annual meeting, between ten and eleven o'clock, or a couple of hours on the second day, or whatever it might be and then, that was it."¹³ With 14 engineers interested in history but no formal training in its practices, Finn found in Jim Brittain an ideal bridge between the two disciplines.

Brittain was familiar with the History Committee's existence through correspondence with committee member and arguably the IRE's first historian, Lloyd Espenschied, in 1967.¹⁴ In response to Brittain's suggestion that IEEE "should have a professional group or journal devoted to . . . the history of electrical sciences and technology," Espenschied explained that on the committee "many are enthusiastic about such articles; but few are willing, or able, to put in the work required to pass muster."¹⁵ Brittain persisted sporadically with other letters as he wrote his dissertation, before Finn, perhaps, encouraged the new committee chair, Charles Susskind, to invite him to join. Brittain attended his first meeting, chaired by Fred Terman, the legendary entrepreneurial Stanford administrator and former IRE president, in March 1973 in Manhattan, New York City.¹⁶

Terman already knew about Brittain's ambitions for IEEE-related history. He had been serving on the committee since 1970 and could not have been satisfied with participating in "social occasions where those in attendance engaged in reminiscing about the old days." The composition, financing, and situation of the committee in IEEE all contributed to, in Terman's words, the "benign neglect" of the history of electrical engineering.¹⁷ Therefore, when Donald Christiansen, the *IEEE Spectrum* editor, sent Terman a copy of Brittain's letter, written in January 1973, responding to an article on the transistor's origins written by a historian of physics, it must have suggested a way forward.¹⁸ Brittain contrasted the dynamism of the American Institute of Physics (AIP) and its Center for the History of Physics, which employed the article's author, with the sporadic activities of IEEE in preserving and promoting its

¹³B. Finn, an oral history conducted in 2010 by S. Hochheiser, IEEE History Center, Hoboken, NJ, USA.

¹⁴A pioneer in maritime radiotelephony in the 1920s, Espenschied wrote the first of his carefully documented history articles in 1937: L. Espenschied, "The origin and development of radiotelephony," *Proc. IRE*, vol. 25, no. 9, pp. 1101–1023, Sep. 1937.

¹⁵L. Espenschied to J. Brittain, Feb. 17, 1967, quoted in *Scanning My Past*, p. 75.

¹⁶The authoritative account of Terman's career is C. S. Gillmor, *Fred Terman at Stanford: Building a Discipline, a University, and Silicon Valley*. Stanford, CA, USA: 2004.

¹⁷F. Terman, "Comments on the history of electrical engineering in IEEE," May 1974, quoted in Brittain, *Scanning My Past*.

¹⁸C. Weiner, "How the transistor emerged," *IEEE Spectr.*, vol. 10, no. 1, pp. 24–33, Jan. 1973.

profession's history. More broadly, he observed that given the historic attention paid to the sciences since the 19th century, "it should not be too surprising that the public, as well as the architects of Government [sic] policy on science and technology, have given more attention to scientific research than to engineering development." Without "a Center for the History of Engineering" to advocate for the historical and ongoing symmetry of engineering and scientific knowledge, efforts "to achieve greater status and to stimulate social responsibility and professional pride may turn out" as poorly as previous attempts.¹⁹

In correspondence with Terman, Brittain proposed a more focused approach based on a center for the history of electrical engineering. Professionally staffed, this could develop bibliographies of resources, histories, awards, a journal, and a newsletter. Terman, well versed in consensus building for new institutions, circulated the new committee member's letters at the meeting for discussion. The eight members attending agreed that it was worth exploring IEEE staff support for "historical and archival activities along the lines of the AIP Center for the History of Physics." In addition, "an IEEE History Center might be jointly sponsored by the IEEE and another organization, such as the Burndy Library," which would actually underwrite the cost.²⁰ As for Brittain's original missive, Christiansen finally published it under the heading, "Engineers Awake!" for the IEEE membership in the May issue of *Spectrum*.

To persuade the IEEE board of directors that a history center was worth investing in, Terman and Brittain corresponded over projects that the Life Members Fund, where Terman had served in 1971 and 1972, would support. Nothing seemed promising until IEEE president Harold Chestnut wrote Terman in November about IEEE's role in celebrating the bicentenary of the United States of America. Perhaps the History Committee could report to the IEEE annual meeting in March 1974 on 200 years of American contributions to electrical and electronic technologies?

Brittain thought this deadline unrealistic for any publication with scholarly standards, but he proposed a number of other projects, "including a colloquium with invited papers by professional historians or the publication of an anthology of relevant papers already published." The correspondence over the response to Chestnut's request overlapped with the annual meeting of the SHOT in late December. There, Brittain conferred with Finn, Susskind, and Thomas Hughes of the University of Pennsylvania, a mechanical engineer turned historian. They hit upon the audiovisual trend of the time: multimedia slideshows, using audiocassette recordings synchronized to 35-mm slide illustrations. Useful for teachers and IEEE sections or chapters, these would be on electrical history, developed

¹⁹E. J. Brittain, "Engineers awake!" *IEEE Spectr.*, vol. 10, no. 5, p. 11, May 1973.

²⁰Minutes of IEEE History Committee Meeting, Mar. 1973, quoted in Brittain, *Scanning My Past*, p. 80.

at the Smithsonian by a graduate student underwritten by the IEEE Life Members Fund.

At the March 1974 History Committee meeting, Reed Crone, committee secretary and managing editor of the IEEE Press, suggested that the committee sponsors a collection of classic papers influencing electrical engineering in the United States. As this echoed Brittain's anthology idea, he took up the editorial role, drawing on an advisory panel of engineers and historians to compile and annotate 64 articles in an IEEE Press volume.²¹

VIII. CREATING AN IEEE CENTER FOR THE HISTORY OF ELECTRICAL ENGINEERING

As these projects evolved, Terman leveraged his prestige, acumen, and contacts to push IEEE toward the history center that Brittain had envisioned. In the late spring of 1974, he submitted a brief report to John D. "Jack" Ryder, then IEEE's vice president, to fulfill a mandatory five-year review of IEEE boards and standing committees. Ryder was a former IRE president and "the ultimate insider at IEEE." In short, Terman was dismayed by the History Committee's lack of continuity, a constituency, or staff support beyond Crone's secretarial role. He introduced the report with the considered opinion that "that electrical engineering history should be given more attention by IEEE than it is now receiving" and asked Ryder to "lend your support to placing some real emphasis on this subject," particularly through "the creation of a Center for Electrical Engineering History at IEEE headquarters." This would entail hiring an entrepreneurial, part-time director for three years who "should combine a missionary zeal with an imaginative turn of mind."²²

By coincidence, or not, Ryder was transitioning from vice president of the organization to chair of the History Committee from 1975 to 1977. One of his responses was to request a meeting with Brittain after reading his comments on Terman's report. They met in Atlanta in October 1974 to discuss ways to build on its recommendations. In particular, they considered funding for a newsletter that would help establish a constituency within IEEE and support for a graduate student in the history of electrical engineering, which Hughes had called for as a way to support his research on the evolution of electrical networks in three countries. Shortly afterward and also by coincidence, or not, Robert Lucky, editor of *PROCEEDINGS OF THE IEEE* who worked with Crone, the journal's managing editor, invited Ryder to prepare a special issue on electrical history from a U.S. perspective. Ryder, in turn, tapped Brittain as coeditor to recruit historians while he found appropriate engineers for an issue that

²¹E. J. Brittain, Ed., *Turning Points in American Electrical History*. New York, NY, USA, 1976.

²²"Quotes from cover letter, Terman to Ryder, 28 May 1974, and comments on the history of electrical engineering in IEEE," Brittain, *Scanning My Past*, p. 85.



Fig. 4. Jim Brittain with his typewriter and files for his biography of Ernst Alexanderson at the family cabin in Mills River, NC, USA, summer of 1974. Courtesy Jo Ann and Jere Brittain.

comprised 23 articles, 16 by historians.²³ In the editorial introduction, Ryder and Brittain explained the unprecedented mix of professional authors and scholars, the benefits that arose from interdisciplinary encounters, and other developments in electrical history. These included relevant activities at SHOT, the Smithsonian, Stanford University's Bancroft Library, and the IEEE Education Group, some of which were underwritten by IEEE Life Members Fund grants.²⁴

Brittain's contributions to the preservation of the history of his field extended well beyond the IEEE History Committee (Fig. 4). In the mid-1970s, he continued to teach; edit SHOT's journal, *Technology and Culture*; and survey and document Georgia's industrial sites for the National Park Service's Historic American Engineering Record. In 1977, he researched and wrote the study that successfully endorsed the scholarly edition of Thomas Edison's papers, which, he asserted, "promised to become the most important documentary project yet undertaken in the field of American technological history." The editor should be a professionally trained historian who would "be willing to stay with it for the long haul." Initiated in 1978 at Rutgers University under Reese Jenkins and continued by director and general editor Paul Israel and a small,

experienced staff since 2002, the Edison Papers project has resulted so far in eight prize-winning volumes of documents from Edison's labs,²⁵ and 500 000 microfilmed and digitized pages covering Edison's activities between 1850 and 1919. Since 1997, the Project has built a steadily expanding website that will become the future platform for the edited papers as well.²⁶

In February 1977, Ryder invited Brittain to serve as vice chairman of the History Committee that year, with the path then cleared to chairmanship in 1978 (Fig. 5). Brittain had proven himself in interacting with Terman and Ryder and in his productivity during the bicentenary. Ryder also invited Brittain to join him in meeting the LMF Committee, as he was aware that it was amenable to projects in electrical history. Beyond more graduate student fellowships, Ryder suggested pitching Terman's history center, as he understood that the LMF was more open to the prospect of a new organization. Perhaps astonished at Ryder's optimism, Brittain cautiously endorsed the pitch as "certainly worthy of careful consideration," but that it would be wise to find out what the Center for the History of Physics entailed financially, to think about locating the center at a university, and to have a full-time director with a formal background in history.

²³*Proc. IEEE*, vol. 64, no. 9, Sep. 1976.

²⁴J. D. Ryder and J. E. Brittain, "Scanning the issue: Special issue on two centuries in retrospect," *Proc. IEEE*, vol. 64, no. 9, pp. 1267–1268, Sep. 1976.

²⁵P. B. Israel *et al.*, Eds., *The Papers of Thomas A. Edison*, vols. 1–8. Baltimore, MD, USA, 1989–2015.

²⁶Thomas A. Edison Papers: Feb. 14, 2019. [Online]. Available: <http://edison.rutgers.edu/index.htm>



Fig. 5. Professor James E. Brittain in his office at Georgia Institute of Technology, c. 1978. Courtesy Jo Ann and Jere Brittain.

That year the LMF underwrote an \$8500 graduate fellowship and another \$1500 for a graduate student research project, while, for the first time, the Executive Committee allotted funds to support the History Committee. These were directed toward the preparation of a report by Michael Wolff with help from Brittain and Ryder on options for IEEE history in the future. Wolff's 33 page "Preserving IEEE's History and Heritage" outlined three options to the 1978 History Committee. The status quo was for the committee to start planning for the organization's centenary in 1984, largely through a book-length history by a professional historian. The middle option was for IEEE to provide a staff member to spend a third of his or her time on History Committee business, the committee now meeting at least twice a year and working on the IEEE archives and a historic landmarks program. The history center represented the ideal, funded for \$148 000 over three years and staffed by a part-time director and assistant who would "lay the groundwork for a permanent center." This would serve "as a dynamic enterprise that serves as a clearinghouse for information and ideas, and as a stimulator of historical research."²⁷

Nine members of the History Committee appeared at the Boston Sheraton Hotel on May 23, 1978 to review the Wolff Report. With their approval, Wolff began discussions with general manager Richard Emberson, other senior staff, and volunteers on presenting proposal to the IEEE Board of Directors. As Chair, Brittain was deeply engaged in coordinating this process with Ryder's appointment to chair the IEEE Centennial Committee and the Life Members Fund's increasingly generous support for

various projects. Happily enough, Robert Lucky was the committee's official liaison with the Executive Committee, which decided what the board reviewed, and he met with Brittain and Emberson in September. As part of his campaign, Brittain published another article on *PROCEEDINGS* in August on "The Contemplative Engineer" that discussed the role and value of engineering history in electrical engineering education.²⁸ Influential readers noticed; immediate past president Joe Dillard wrote Brittain that he was "doing a great job as Chairman of the History Committee" which was "appreciated by the . . . Board of Directors of the Institute."²⁹

Introduced by Vice-President Lucky at the December 1978 IEEE Board Meeting, Brittain set out the need to identify, preserve, and disseminate materials and histories related to IEEE and its members, and proposed the progressive development of a history center that would operate full time by the AIEE-IEEE centenary in 1984. The Board responded by voting to allot \$25 000 as the first appropriation for the "Establishment of a Center of the History of Electrical Engineering." Nine months later, it accepted a review committee's recommendations for a history center along the lines that Brittain had proposed.

Robert Friedel became the first director in 1980 (Fig. 6).³⁰ Today, the IEEE History Center, under the direction of Michael Geselowitz and the History Committee, has a staff of six working at Stevens Institute of Technology and the Operations Center in Piscataway, NJ, USA, to preserve and catalog the IEEE Archives; administer the IEEE Milestones program and prepare the Newsletter; maintain and expand the Engineering and Technology History Wiki; conduct and edit over 800 oral histories; edit and write "Scanning Our Past" articles for *PROCEEDINGS OF THE IEEE*; design exhibits and organize conferences; and develop and promote high school inquiry units in the history of technology through the REACH program. Looking back at what he had started, Brittain wrote in 2012 that the IEEE History Center's "success has exceeded my most sanguine expectations."³¹

IX. OTHER LEGACIES IN HISTORY

In addition, over nearly 60 years, Brittain published 398 articles, including hundreds for *PROCEEDINGS OF THE IEEE*. There he initiated the monthly "Scanning The Past" section (now "Scanning Our Past") and served as a member of the editorial board for 27 years, until 2017. Brittain

²⁸J. E. Brittain, "The contemplative EE: Engineering history and education," *Proc. IEEE*, vol. 66, no. 8, pp. 29–825, Aug. 1978.

²⁹J. Dillard to J. Brittain, Sep. 1978, quoted in *Scanning My Past*, p. 100.

³⁰R. Friedel, "An oral history conducted in 2010 by Sheldon Hochheiser," *IEEE History Center*, Hoboken, NJ, USA. Accessed: Feb. 15, 2019. [Online]. Available: https://ethw.org/Oral-History:Robert_Friedel

³¹J. E. Brittain, "Scanning my past: Some personal reflections stimulated by proceedings centennial," in *Proc. IEEE*, vol. 100, no. 5, p. 1902, May 2012.

²⁷Wolff Report, 1978, quoted in *Scanning My Past*, p. 97.

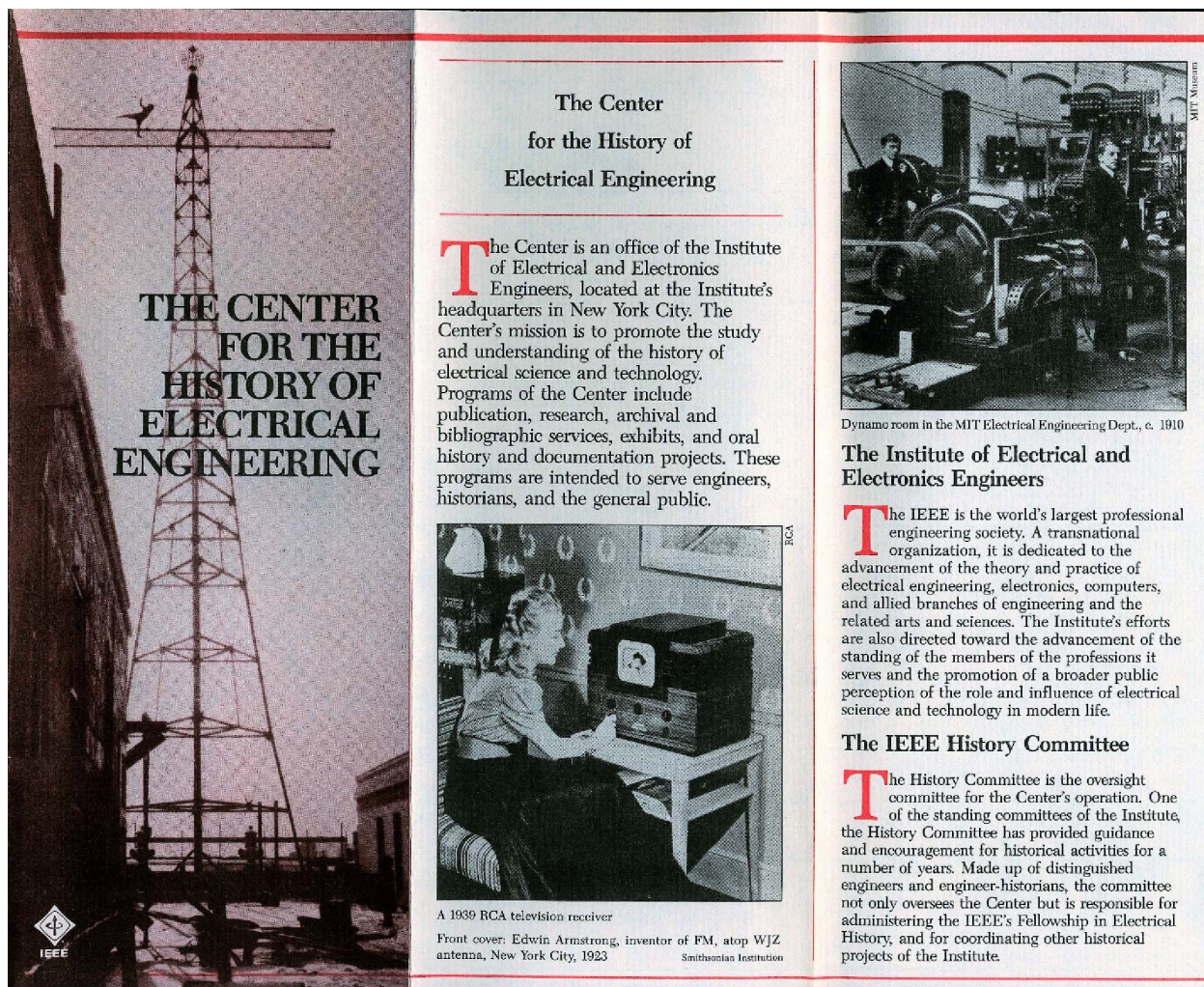


Fig. 6. One of founding History Center director Robert Friedel's first tasks in 1980 was to create a brochure to spread the news of its creation. IEEE History Center.

chaired the IEEE History Committee twice, and in 1987, the IEEE elected him a Fellow "for the development of the field of electrical history." He became a professor emeritus in 1994 and Life Fellow in 1995 after writing four books and encouraging thousands of people at Georgia Tech and around the world to account for the social, political, economic, and cultural contexts that shape and interact with humanity's developments in engineering, technology, and science.

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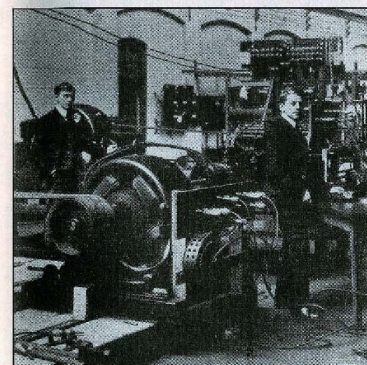
The Center for the History of Electrical Engineering

The Center is an office of the Institute of Electrical and Electronics Engineers, located at the Institute's headquarters in New York City. The Center's mission is to promote the study and understanding of the history of electrical science and technology. Programs of the Center include publication, research, archival and bibliographic services, exhibits, and oral history and documentation projects. These programs are intended to serve engineers, historians, and the general public.



A 1939 RCA television receiver

Front cover: Edwin Armstrong, inventor of FM, atop WJZ antenna, New York City, 1923
Smithsonian Institution



Dynamo room in the MIT Electrical Engineering Dept., c. 1910

The Institute of Electrical and Electronics Engineers

The IEEE is the world's largest professional engineering society. A transnational organization, it is dedicated to the advancement of the theory and practice of electrical engineering, electronics, computers, and allied branches of engineering and the related arts and sciences. The Institute's efforts are also directed toward the advancement of the standing of the members of the professions it serves and the promotion of a broader public perception of the role and influence of electrical science and technology in modern life.

The IEEE History Committee

The History Committee is the oversight committee for the Center's operation. One of the standing committees of the Institute, the History Committee has provided guidance and encouragement for historical activities for a number of years. Made up of distinguished engineers and engineer-historians, the committee not only oversees the Center but is responsible for administering the IEEE's Fellowship in Electrical History, and for coordinating other historical projects of the Institute.

ABOUT THE AUTHOR

Alexander B. Magoun received the B.A. degree in history from Trinity College, CT, USA, in 1981, the M.A. degree in history from the University of East Anglia, Norwich, U.K., in 1984, and the Ph.D. degree in American history from the University of Maryland, College Park, MD, USA, in 2000.

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