The History of the Engineering Libraries Division, Part 2: 1960-2017

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Introduction

The Engineering Libraries Division (ELD) of the American Society for Engineering Education (ASEE) is one of the oldest professional communities of engineering and technical librarians in the world. It is also one of the few engineering organizations where librarians and professors are recognized as academic professionals. First organized as a regional committee in 1941 and established as a national committee in 1942, ELD achieved divisional status within ASEE in 1967. This year, 2017, marks the 50th anniversary of ELD's division status and the 75th anniversary of the first Engineering School Libraries Committee. This paper explores the history of ELD from 1960 to the present. The author's preceding paper, published in 2016, covered the history of librarians in ASEE from 1893 through the 1950s.[1]

The history of ELD over the past fifty years has been marked by three major themes or trends. The first trend is rapid and continuous technological change, beginning in the late 1950s, that has transformed how scientific and technical information is created, disseminated, stored, and retrieved. The 1970s and 1980s was a time of rapid technological change for academic libraries. In quick succession, library information systems automated many library processes, electronic catalogs replaced card catalogs, online and CD-ROM databases replaced print indexes, and electronic publishing emerged as a viable alternative to print journals and books. The process accelerated in the 1990s and early 2000s with the rise of the Internet and Web, digital publishing, and mobile computing.

The second theme is the continuous struggle by engineering librarians to assert their role within ASEE and in engineering education in general. ELD has always been a small community in a large organization and has faced the possibility of extinction on several occasions. ELD has also worked hard to expand the role of librarians in engineering instruction and accreditation.

The third trend, which is not unique to engineering libraries, is the ongoing challenge of providing adequate services and collections in the face of rising costs, proliferation of information resources, diminished institutional support, and increasing competition for resources. In the early 1970s, financial and copyright issues began to emerge as significant problems for academic libraries. Although librarians had long strived to provide adequate services with inadequate resources, during the 1970s administrators increasingly demanded proof of library productivity and efficiency. The long-simmering debate between departmental and centralized libraries began to shift in favor of the latter as universities sought to cut costs and reduce duplication.

Scope and sources

This brief history of ELD is based primarily on published information and unpublished materials located in the ELD Archives at the University of Massachusetts Dartmouth. The ELD Archive contains correspondence, minutes, records, published and unpublished papers, and other historical material, mainly from the 1960s through the 1980s. The author visited the ELD Archive in October 2016 and spent two full days reviewing the files. The ELD website provides

access to ELD newsletters, minutes, records, and reports, from the 1980s forward. Published materials were sourced from the *Journal of Engineering Education*, ASEE conference proceedings, engineering and library journals. Although many of the people who were involved with ELD during the last fifty years are still alive and active members, none were formally interviewed due to time and resource constraints. An oral history project would be a valuable addition to the history of ELD. This paper does not presume to be a comprehensive history of engineering libraries and librarianship, engineering information, or education although it touches on these subjects in the context of the history of ELD.

ASEE goes to Washington: 1960-65

The early 1960s was a time of transition for ASEE. Since its founding in 1893, ASEE had been administered by member volunteers with substantial support from engineering colleges. For example, the College of Engineering at the University of Illinois provided office space and support staff for ASEE from the 1950s through the early 1960s. ASEE annual conferences and section meetings were organized by members and usually held on university campuses. Membership dues and advertising revenue supported ASEE's flagship publication, the *Journal of Engineering Education* (JEE). This system worked well for a small association with a few thousand members.

In the years after World War II, however, ASEE membership grew rapidly. In 1940, ASEE had 3,086 individual members and 147 institutional members. By 1960, membership had increased to 9,120 individual members and 420 institutional members.[2] ASEE continued to grow through the 1960s. In 1963, ASEE president Kurt F. Wendt, dean of engineering at the University of Wisconsin, praised a membership drive that resulted in over 1,000 new members in a single year.[3] By the beginning of the 1970s, ASEE membership stood at 12,157 individual members and 562 institutional members, which is close to current (2016) totals.

The early 1960s saw growing public interest in science, engineering and technology in the context of the Cold War rivalry between the U.S. and Soviet Union. The U.S. government, concerned about recent Soviet achievements in science and engineering, especially in space and military technologies, greatly increased funding for research and education. Federal funding for R&D increased from $74 million in 1940 to $12 billion in 1963, or about 13 percent of total federal expenditures.[4] In July 1964, the National Science Foundation (NSF) established a Division of Engineering to provide more focused support for engineering education and research. The National Academy of Engineering, a private, non-profit institution whose goal was to provide leadership and advice on matters related to engineering and technology, was also founded in 1964.

During the 1950s student enrollments in engineering programs increased at all levels, especially after 1955. Undergraduate enrollments, including part-time students, rose from 142,954 in 1950 to 205,765 in 1964.[5] Enrollments continued to increase through the 1960s as members of the Baby Boom generation reached college age. At the graduate level enrollment growth was especially strong. In 1950, the number of master's and doctoral students, including part-timers, was 15,575 and 2,795, respectively. By 1964, there were 41,653 master's students and 12,572

doctoral students.[5] Despite some growth in the number of women studying engineering, they were still vastly outnumbered by male students. Out of a total of 37,679 engineering bachelor's degrees awarded in 1959-60, only 142 went to women.[6]

In 1963, amidst these developments and partly in response to them, ASEE established a permanent office and staff located in Washington, D.C. A year later, in 1964, the editorial offices of the *Journal of Engineering Education* moved to the new ASEE headquarters, raising the total full-time staff to twelve. In addition to providing for the resources to manage a large and growing organization, ASEE hoped that the move to Washington would facilitate cooperation and communication with government agencies and other educational organizations. At about this time, ASEE staff also began to administer external contracts and government grants in support of engineering education and faculty development. One popular program was the ASEE-NASA Summer Faculty Institutes, which was designed to encourage the development of engineering faculty knowledge of the latest space science and to facilitate collaborations between faculty and NASA researchers. By 1964 the total amount of external funding under ASEE management was $500,000, approximately double the society's annual budget.[7] The ASEE headquarters continued to grow over the next few years and by the end of the decade there were 24 full-time staff.

Engineering School Libraries Committee: New faces, old challenges

The early 1960s was also a transitional time for the Engineering School Libraries Committee (ESLC). During the late 1950s, the number of librarians in ASEE declined from 57 to 46. However, at the 1960 ASEE meeting at Purdue University, ESLC Chair Jeanette Poor, engineering librarian at Cornell, reported that membership had increased again to 57.[8] Many of the librarians who had provided leadership to the engineering librarian community within ASEE in the 1940s and 1950s had retired or moved on in their careers.

In addition to Jeanette Poor, a few veterans of ESLC's early years were still active in ASEE. Edward Chapman of Rensselaer Polytechnic Institute, John Moriarty of Purdue University, Madeline Gibson of the Michigan College of Mining & Technology, Ira Tumbleson of the Newark College of Engineering, and Johanna Tallman of UCLA continued to serve on the ESLC and occasionally attend ASEE conferences. However, the engineering librarian cohort in ASEE was clearly getting older. Of the nine librarians who served as ESCL chair from 1942 through 1960, all but one earned their library degrees and started their professional careers prior to 1939. Fortunately, a new generation of engineering librarians began joining ASEE in the late 1950s and early 1960s. Among these were several leaders who would over the course of the decade revitalize and strengthen the engineering librarian community within ASEE. They were John P. McGowan, Warren N. Boes, Thomas L. Minder, and Karen G. Takle.

John P. McGowan was the library director at the Franklin Institute in Philadelphia, a position he had held since 1959. He joined ASEE in 1956 and served as ESLC chair from 1960 to 1962. Born in 1926, McGowan served in the army during the World War II. After the war he resumed his studies, earning a BA in English from Hunter College in New York in 1950 and an MLIS from Columbia University in 1951. His first professional position was librarian for the New

York University (NYU) College of Engineering, where he worked from 1951-56. He then served as engineering librarian at Northwestern University's Technological Institute from 1956-59.

While working at NYU McGowan took courses toward a bachelor's degree in industrial engineering, which he finally completed in 1966. The same year he returned to Northwestern University as associate university librarian and was then promoted to university librarian in 1971. McGowan was a leader in library automation, directing the development and implementation at Northwestern of NOTIS, an early library information system and online public access catalogue. In 1989, ACRL awarded him the Academic Librarian of the Year in recognition of his vision and leadership in library automation. He retired from Northwestern in 1992 and died in 2007 at the age of 79.[9]

John P. McGowan, c. 1957. Photograph by Eugene L. Ray, Courtesy Northwestern University Archives.

Warren N. Boes was born in 1931 and attended the University of Michigan where he earned two master's degrees. He served as the chemistry librarian at Michigan from 1954 to 1958. In 1959 he was appointed library director at the Polytechnic Institute of Brooklyn. He joined ASEE in 1961 and served as ESLC chair from 1962 to 1964. In September 1964 Boes was appointed assistant director of libraries at Syracuse University. A year later, in 1965, he was appointed acting director and then director of libraries in 1966. During his tenure he oversaw the planning and construction of a new research library for the humanities and social sciences, the Bird Library, which opened in 1972. However, his plans to merge some departmental libraries met with resistance from faculty.[10] In 1973 Boes left Syracuse to become the director of libraries at the University of Georgia in Athens. His time at Georgia was marked by allegations of autocratic behavior toward library staff, administrative mismanagement, and financial irregularities. In 1978 he was forced to resign following an internal investigation.[11] Boes went on to serve as library director at Michigan Technological University until his sudden death from an apparent heart attack in 1980 at the age of 50.[12]

Thomas L. Minder, the oldest of the group, was born in Illinois in 1925 and served in the U.S. Navy during World War II. After the war he studied mathematics and information science at the University of Chicago. In the 1950s he apparently worked as a librarian at the research division of famed aircraft manufacturer Curtis-Wright. He earned an MLIS at the University of Chicago in 1963. His dissertation was titled *The Engineering Standard as a Form of Literature*.[13] In 1960, Minder moved to Penn State University, where he served as engineering librarian from 1960 through 1965. He joined ASEE in 1960 and served on the ESLC through the mid-1960s.

Minder developed an expertise in library automation and systems analysis. While at Penn State he wrote the first successful computer program for managing library acquisitions.[14] In the late 1960s, he worked as a systems analyst with IBM in Maryland and taught library systems analysis at Catholic University of America in Washington, D.C. In the early 1970s, he was the assistant

director of Science and Engineering Library Services at the University of Pittsburgh. Minder completed a PhD in information science at Pittsburgh in 1982 and pursued a career as a professor, teaching at the University of Alabama, Tuscaloosa, Joliet Junior College, and DePaul University, and as a visiting professor in Turkey the 1970s and China in the 1980s. He retired in 1989 and died in 1998 at the age of 72.[15]

Karen Takle, c. 1962. Author photo from American Engineer, vol. 32, May 1962, p. 38.

Karen Takle was the youngest of the four engineering librarians. A native of Wisconsin, she graduated with a BS degree in zoology from the University of Wisconsin in 1958. After completing a summer institute at the University of Norway in Oslo, she went on to study library science at Rutgers University, graduating with an MLIS in 1959. Her first professional position was engineering librarian at Princeton University, where she worked from 1959 through 1962. It is not clear what drew Takle to engineering librarianship and technical information, but she quickly immersed herself in the field.

One of Takle's earliest publications was a *Bibliography of Selected Engineering Literature Sources in the Area of Transportation and Urban Planning*, published by Princeton in March 1962. A few months later she published an article in *American Engineer* that highlighted various technical information resources. Takle also emphasized the usefulness of literature guides for obtaining ideas "on reading, studying, note taking, indexing, and literature searching."[16] Two diagrams included in the article depicted a simplified model for information searching and information synthesis.

Takle was active in numerous library, engineering and science associations. She joined ASEE in 1961 and became a member of the ESLC in 1962. She was also a member of the Science and Technology Division and Metal Division of the Special Libraries Association (SLA), Society of Women Engineers (SWE), American Association for the Advancement of Science (AAAS), and the American Documentation Institute (ADI), now the American Society for Information Science and Technology (ASIST).

After a few years at Princeton, Takle decided on a major career change. In November 1962 she accepted an appointment as an assistant professor in the Graduate School of Library Science at the Drexel Institute of Technology in Philadelphia. In addition to teaching courses in the MLIS program, Takle conducted research on foreign technical information. From 1963-64, she was the assistant director and senior investigator of the Foreign Engineering Literature Research Project. At the 1963 ASEE conference in Philadelphia, she presented her research on German engineering literature.[17] Takle's academic career was short-lived. In late 1965 or early 1966, she left Drexel to become a systems librarian with IBM in San Jose, California. She remained active in ELD well into the 1970s, leading the division's literature guide project. She worked at IBM for the rest of her career and was active member of SLA's Silicon Valley Chapter. In honor of her long service she received the Chapter's Mark H. Baer Award in 2005.

As the ESLC approached its twentieth anniversary in 1962, engineering librarians in ASEE could look back on many accomplishments. ESLC had a small but stable membership. It had organized a number of successful programs at ASEE annual conferences. And two ESLC members, John Moriarty and John McGowan, were members of the JEE editorial board. However, there was also a growing sense of frustration among ESLC members with the lack of success in integrating library instruction into the engineering curriculum.

At the 1961 ASEE conference at the University of Kentucky, librarians held a roundtable to discuss the situation. About 20 people attended the meeting including Boes, McGowan, Minder, and Takle.[18] During the discussion it was noted that very few engineering schools required students to learn how to use the library or engineering literature. Librarians reported great difficulty in persuading faculty, especially older faculty, of the value of library instruction. Most engineering faculty seem indifferent to the role of the library in undergraduate education. Karen Takle of Princeton reported some success in organizing small workshops on specific topics. Thomas Minder of Penn State advocated working with individual departments to integrate instruction into the curriculum. John Moriarty of Perdue argued that teaching students to use the library is not the same as teaching them to use the engineering literature. John McGowan took an evidence-based position, suggesting that librarians needed to conduct more research on the effect of library instruction on engineering students. Finally, Warren Boes of the Polytechnic University of Brooklyn and Gordon Allen of the University of Maryland argued that librarians needed to advertise their services more aggressively. At the end of the discussion, Minder proposed a course of action that was approved unanimously. Unfortunately, the details of his proposal do not survive.

A year later, there was little improvement in ESLC prospects. In May 1962, John McGowan wrote to the incoming ESLC chair, Warren Boes.[19] In his letter, McGowan highlighted some of the opportunities and challenges facing ESLC as he saw them. He lamented the lack of responses from ESLC members to his numerous letters requesting feedback and memoranda updating them on developments in ASEE. On a positive note, he reported that the idea of establishing an ESLC newsletter had received a few endorsements. It is not clear if McGowan or anyone else was aware that ESLC had published an irregular newsletter in the 1940s. Finally, McGowan suggested that it was time for ESLC to review its mission and membership. He recommended broadening its constituents to include ASEE members "interested in topics such as information retrieval, machine translation of languages and other elements that appear to have more attraction than just library elements." McGowan ended the letter with a warning: "[U]nless the committee begins to develop a broad base of operations, I would say that perhaps we should give up the spirit."

McGowan did his best to encourage librarian participation in ASEE. In a letter addressed to science and engineering librarians a few months before the 1962 ASEE meeting at the U.S. Air Force Academy in Colorado, he appealed to their sense of professionalism and desire for recognition as academic staff.[20]

> "Librarians are continually working for recognition as equals with other professions and in the academic world as fellow faculty members. One of the best ways to win

recognition is by participating in the societies of other professions where we can demonstrate our value directly."

Librarians should attend the ASEE conference, McGowan argued, because "[t]hese are the people whom you want most to impress with the capabilities of our profession and with the information facilities we administer." Unfortunately, McGowan's letter had little impact and librarian attendance at the conference was lower than expected, possibly because it coincided with the ALA annual conference.

McGowan's concerns about the future of ESLC may have arisen out of the recent development of computer information storage and retrieval systems that some experts claimed would make libraries obsolete. Some experts predicted that by 1970 technical libraries would be completely automated.[21] In late 1961, ASEE nominated McGowan and George S. Bonn, a former ESLC chair, to serve on the Engineering Information Services Committee of the Engineers Joint Council (EJC).[22] Formed in 1952, the EJC was a federation of three dozen American engineering societies including ASEE. The EJC's main purpose was to facilitate cooperation among its members in order to address common problems.[23] It was especially interested in technical information, libraries, and engineering education. For example, in the early 1950s the EJC led an initiative to rebuild the engineering libraries of war-ravaged countries by serving as a clearinghouse for book donations. In the late 1950s, the EJC established the Engineering Information Services Committee and a Computation and Information Processing Systems Committee in order to address problems associated with the dissemination of technical information.

In January 1962, the EJC convened a special meeting in New York to discuss the "engineering information" problem. In attendance were more than 150 representatives of engineering and scientific societies, government, and industry.[24] It is not clear if McGowan attended the meeting, but Thomas Minder, engineering librarian at Penn State and a member of the ESLC, was present and published a report on it in the *Journal of Engineering Education*.[25]

The engineering information problem

In the years after World War II, scientists, engineers, publishers, policymakers, and librarians became increasingly concerned about the proliferation and growth of scientific and technical information. As the volume of new publications increased, scientists and engineers found it increasingly difficult to stay informed of new research and search the literature. Librarians were challenged by financial and space constraints. Investment in academic libraries had not been a priority during the war and many libraries struggled with inadequate facilities and out-of-date collections. The so-called "information explosion" of the 1950s was the product of several factors.

The main cause of the explosion was the natural growth of science, a phenomena documented by science historian Derek J. de Solla Price in his classic 1963 work, *Little Science, Big Science*.[26] Throughout the late 19th and 20th century the production of journal articles, the primary means of scientific and technical communication, increased year-over-year, declining only during the first and second world wars. A few years after the end of World War II the

number of articles published resumed growing at an accelerated pace. By the early 1960s, Price and other experts estimated that scientific literature was doubling every eight to fifteen years.[26] For example, the number of abstracts indexed annually in *Engineering Index* increased from approximately 26,000 in 1950 to 63,000 in 1965. In the face of such growth journals struggled to keep pace. Manuscripts piled up in editorial offices and publication delays grew every longer. In an attempt to remedy the situation, commercial and society publishers launched ever-more specialized journals. Many translation journals, some subsidized by the National Science Foundation (NSF), appeared in order to disseminate research from China, Japan and the Soviet Union.

New forms of scientific and technical communication also emerged. Immediately after the war the U.S. and its allies declassified huge quantities of wartime technical reports and captured enemy technical documents. In 1945, both the U.S. and Canadian governments established special organizations to manage the flow of declassified technical information and reports arising from government-sponsored research. The Office of the Publication Board, located in the Department of Commerce, evolved into the Office of Technical Services and eventually, in 1970, the National Technical Information Service (NTIS). President Eisenhower's "Atoms for Peace" initiative in the mid-1950s resulted in the declassification of thousands of documents related to nuclear research.

Many librarians assumed (or hoped) that after the war technical reports would disappear along with other wartime measures such as rationing and air raid drills. However, continued government support for research fueled a steady increase in technical reports. In the early 1950s, as estimated by Fry, U.S. government agencies and contractors were producing 75,000 classified and unclassified technical reports annually.[27] By the early 1960s, the number of technical reports produced annually had grown to 100,000.[28]

Other types of technical publications increased as well. The number of U.S. patents issued annually grew from 25,694 in 1945 to 94,629 in 1965.[29] Theses and dissertations increased in number as graduate enrollments surged in the 1950s and 60s. In an attempt to cope with the increasing amount of new research being published worldwide, some companies reassigned research staff to become full-time "information scientists" tasked with scanning and reading the new literature.[30]

The main outcome of the EJC meeting was a proposal to create a universal engineering thesaurus containing terms from all technical fields. The plan called for the EJC to solicit engineering terms from all of its members and combine them with terms from established discipline-specific thesauri such as the one recently compiled by the American Institute of Chemical Engineers (AIChE). The EJC plan benefitted indexers, abstracters, and engineers developing computerized information storage and retrieval systems. The EJC also hoped that authors and journal editors would voluntarily adopt the thesaurus in order to facilitate the writing of abstracts, indexing and retrieval.[24] As an incentive, the EJC offered free training in abstracting and indexing technical articles.

In his report, Minder praised the EJC thesaurus, but criticized the proposal for failing to provide for ongoing revisions. He expressed puzzlement at the absence of representatives from the American Standards Association, Library of Congress, and National Science Foundation, all of which had active information research programs. Minder also argued that the creation of a common engineering thesaurus would be a wasted effort unless engineers were trained in its use. Most engineering schools, he observed, did not train students to use the engineering literature. Minder suggested that ASEE should launch its own information research program. The EJC thesaurus project moved quickly and the first edition was published in 1964.[31] It was so well-received that the EJC published a revised and expanded edition a few years later in 1967.[32]

Although few in number, librarians were keen to raise their visibility within ASEE. One idea that emerged at the 1961 ESLC roundtable in Lexington, Kentucky was to publish a regular column in ASEE's flagship journal, the *Journal of Engineering Education* (JEE). During the ESLC business meeting, John McGowan reported that the JEE editor, John Bryant, had tentatively agreed to provide space and assistance if ESLC provided the content. At the time, McGowan was a member of JEE's editorial board and probably lobbied Bryant about the idea before bringing it to the ESLC. Bryant had been appointed JEE editor in 1958, probably due to his experience as assistant editor at the Engineering Experiment Station at the University of Illinois. After a brief discussion, it was decided that the column should highlight recent books and articles on engineering education. Karen Takle volunteered to take on the project.

The inaugural "Scanner's Corner" appeared in JEE in June 1962. Takle was the author of the piece although her name did not appear on it; later columns did credit her as author. The purpose of the column was to report on "news in the fields of engineering, information services, and storage and retrieval systems." In her first column, Takle reported on the Senate Committee on Government Operations' study of scientific information handling, the Engineers Joint Council's Engineering Information Symposium, and a conference on machine literature searching activities sponsored by the Center for Documentation and Communication Research at the School of Library Science, Western Reserve University. Later columns included announcements of new foreign scientific and technical books and journals, directories of technical information services, and book recommendations. Takle wrote approximately ten Scanner's Corner columns from June 1962 to June 1965. Later editions featured a cartoonish drawing of a stereotypical female librarian wearing horn-rimmed glasses surrounded by stacks of books. The series ended in 1965, around the time that Takle left Drexel for her new position at IBM in San Jose, California.

"Scanner's Corner" Illustration, Journal of Engineering Education, 1963.

Dr. Weinberg's Report

The problems created by the information explosion did not go unnoticed at the highest levels of the U.S. government. As research funding increased, some politicians and policymakers became concerned about unnecessary waste and duplication arising from the inability of scientists and engineers to access technical information efficiently. In 1961-62, the Senate Committee on Government Operations conducted a series of hearings on technical information. The role of technical information in national security was cited as a major concern. In 1962, the President's Advisory Committee on Science formed a Panel on Science Information and tasked it with preparing a report and recommendations regarding technical information dissemination, which it published in January 1963. The report quickly became known as the Weinberg Report after the chair, Dr. Alvin M. Weinberg, director of the Oak Ridge National Laboratory. The other members of the panel were scientists and engineers from various government agencies, universities and corporations.

The report's numerous recommendations addressed every aspect of technical information from the writing of abstracts to the development of information handling systems; use of citation indexes, the reduction of unnecessary and duplicative publications, and the creation of a national network of technical information centers. One of its major recommendations was to improve student education in information retrieval and the use of literature. Noting that some disciplines, notably chemistry, did require students to take courses on using the literature, engineers "receive virtually no training in literature techniques, and they pursue their daily work unmindful of the powerful resources awaiting their call." The report called for accreditation agencies to consider not only the "adequacy of the library… but also the ways in which its use is promoted and facilitated."

The Weinberg Report spurred the EJC to organize an Information Systems Program to investigate and implement some of the recommendations. The ASEE Board endorsed the EJC program at its 1963 fall meeting, apparently without consulting the ESLC. In December 1963, ESLC chair Warren Boes wrote to ASEE president Kurt F. Wendt expressing his concerns over the Board's failure to consult ESLC, noting that "my Committee is the obvious source of contact in the organization before adopting an information program."[33] Boes also criticized the EJC program as being "mainly a program of computer education rather than concern[ed] with the engineer['s] needs for information." A week later, Dean Wendt replied with an explanation.[34] He reported that the ASEE Board had intended to refer the matter to the ESLC and ask it to develop "an appropriate program." He also expressed his pleasure at learning that Boes, John McGowan and Thomas Minder were members of a new Information Systems Committee chaired by Morris Rubinoff, professor of electrical engineering at the University of Pennsylvania. Finally, Wendt mentioned a recent letter he had received from Karen Takle concerning ASEE's possible involvement in an information retrieval project under development at the Drexel Institute.

Intellectual refineries

In June 1964, ASEE members traveled to the University of Maine at Orono for the society's 71st annual conference. In his presidential address on June 22, Elmer C. Easton, dean of engineering at Rutgers University, highlighted the engineering information problem.[35] Referring to the

tremendous growth in scientific and technical literature, he called it "a serious obstacle to the student who seeks the shortest path to the most important concepts." He called for a national program, presumably led by ASEE, to organize teams of engineers and scientists, aided by modern computers and machine translation systems, whose role would be to "digest the world's technical literature, eliminate the unnecessary redundancy, and publish the distilled essence of significant information." Easton called his vision an "intellectual refinery," a "fully automated, continuously operating" facility that would print publications, books and other materials as needed. Out-of-date books and redundant information would be a thing of the past.

Although Easton had not suggested that libraries would soon be obsolete, the ESLC's 1964 program reflected an understandable level of anxiety among engineering librarians. The first session was called "The Elimination of the Technical Library" and featured papers such as "Vitality of the Technical Library" by Sam Cabeen of the New York-based Engineering Societies Library and "Future of the Special Librarian: Bright or Bleak?" by Alan M. Rees of the Center for Documentation and Communication at Western Reserve University in Cleveland.

In another session called "Problems of Engineering School Libraries", Thomas Minder addressed how to teach faculty about new information services and Robert S. Taylor of Lehigh University gave advice on preparing for "machine methods." In a paper titled "What to do 'til Dr. Weinberg Comes," Jeanne North, engineering librarian at Stanford, prescribed first aid measures to relieve "sick" libraries from "informational indigestion."[36] She encouraged librarians to remove obsolete books from their working collections, noting that they obscure more recent publications and discourage students from using the "smelly old library." Collections of technical reports and standards, neglected or absent in many libraries, should be given the same attention as books and journals. She advised librarians to stop teaching students the "intricacies of the Dewey Decimal System" and start preparing them to use keyword and citation indexes and computer-based systems. Librarians should experiment with document delivery services and rapid processing of new books in order to meet the time-sensitive needs of their users. Finally, North argued that libraries could reduce costly and unnecessary duplication by better coordination of collection development policies.

Walter M. Carlson, chair of the EJC Information Systems Committee, delivered a paper on the "Challenges and Opportunities of the Weinberg Report"[37] which focused on the need to educate engineering students in the proper use of information. Noting that young engineers are "poorly equipped to perform the tasks expected of them because they lack the elementary skills needed to use the modern tools of technical communication," Carlson argued that the best course of action was not to require students to take a course on library research methods, but rather to embed information assignments within existing engineering courses. Students would be assessed on their ability to use information resources within their assignments. Furthermore, Carlson suggested that if such a pedagogy was adopted, "deans and department heads would have to evaluate their staff members according to the quality and breadth of each faculty member's personal knowledge and utilization of information resources." Accreditation criteria would have to be revised to address not only the library but also the ability of engineering faculty to "use the full range of technical information facilities that exist on the campus or nearby."

Carlson also argued that librarians must adapt their methods to this new pedagogical approach. Noting that engineers "want and need answers… not… documents to wade through to get the answers." Carlson advised librarians to stop providing assistance in the form of "vague references to books or journals that *might* contain the answers." Libraries that continued to do so ran the risk of alienating faculty and students who will abandon the library in favor of "other information sources that are technically oriented to produce answers for engineers." Carlson then challenged engineering educators and librarians to find "three relevant information items" in each course and assign students the responsibility of finding them. Carlson believed that such an approach, adopted across an entire curriculum, would develop in students "a fairly sophisticated knowledge of what the campus has to offer in the way of information resources." Of course, the idea of integrating library resources with regular engineering courses had been proposed by librarians before.[38]

Although ASEE President Easton's vision, which was clearly inspired by the Weinberg Report, may have alarmed some librarians, he apparently had no intention of putting them out of business. In fact, he needed their help. During the ESCL business meeting, Warren Boes reported that Easton had asked ESLC to undertake three important tasks.[39] First, Easton asked ESLC to develop a model program for training undergraduate students in new information retrieval systems. Second, he asked for ESLC's advice on information curricula for science and engineering librarians. After some discussion, it was decided that proposals being developed by Karen Takle and Thomas Minder would satisfy the first two requests.

Minder's proposal had two parts. The first was to develop a series of "workshops, seminars, or short courses to help the engineering faculty teach students to use information as an everyday working tool." The second was to "study the information system needs that will enable teachers, information services, and engineers to better accomplish their goals."[39] Takle's proposal consisted of a survey of engineering libraries to determine what resources, services and methods of instruction were presently available and how they might be integrated into the engineering curriculum.

The third task was to prepare a report addressing the future role of the engineering library; the role of information retrieval in the use of library resources; and the integration of information resources into the curriculum. An ad hoc committee led by William N. Locke, director of libraries at MIT, was charged with preparing the report.

In July, a few weeks after the conference, Easton wrote to Warren Boes and asked ESLC to study his proposal and draft a plan for a pilot study that would "test the feasibility of the operation."[40] Noting that substantial financial support would be required, Easton recommended that ESLC consult with ASEE's Information Retrieval Committee and draw up a funding proposal that could be submitted to the NSF or a private foundation. Boes was in the process of moving to a new position at Syracuse University and apparently did not receive the letter until sometime in the fall. He replied to Easton in November, apologizing for the delay and promising to discuss the proposal at the next ESLC meeting early in 1965.[41]

In April 1965, Boes wrote to Cornelius Wandmacher, dean of engineering at the University of Cincinnati and chair of the ASEE Council of General Divisions, ESLC's parent organization.[42] Boes claimed that Easton had failed to reply to several letters sent in December and January. He then reported that the ESLC had discussed Easton's proposal for an "intellectual refinery" and reached a consensus that it was not feasible given the present state of technology, adding that Morris Rubinoff's Information Retrieval Committee had reached a similar conclusion.

Boes then shifted to the issue of undergraduate instruction, which he referred to as a "graver and more immediate problem." He argued that the Engineers Council on Professional Development (ECPD), an accrediting body, should require every engineering student to take a course in information systems, including "libraries and bibliographies." He concluded that "once engineers are required to take such courses that many of the so-called problems of information will disappear." Boes did not mention the Locke Committee and it is not clear that it ever produced a report. He did inform Wandmacher that Karen Takle and Thomas Minder had both moved to new positions and had not made much progress on their proposal for a study of the role of information in engineering practice and teaching.

The information problem continued to trouble engineers and scientists. In January 1967, the Engineers Joint Council organized a three-day conference in New York to discuss the difficulties facing publishers of engineering journals.[43] Speakers enumerated a long list of woes facing publishers. Since 1945, the page length of articles had increased by fifty percent. Publishing costs were also increasing while advertising revenue was down due to competition from commercial publishers. Some societies had introduced page charges in order to offset costs. The proliferation of new journals and low-quality articles were also cited as major problems. It was noted that commercial publishers had been far more responsive to researchers needs in developing new review journals.

One of the main speakers at the conference was science historian Derek J. de Solla Price, who offered a "sweeping analysis" of the problem. Describing the current publishing system as an "Alice-in-Wonderland" race, Price argued that the exchange of preprints among small groups of researchers, facilitated by new computer technology, would be as effective in disseminating research finds while reducing the number of minor articles. Articles of significant and lasting value would be published in archival journals and proceedings. Price further suggested that many engineering books and journals could be replaced by "data banks" which engineers could query as needed. Echoing the findings of the Weinberg Report, he noted that engineers want answers and facts, not "enormous mountains" of literature.

A number of projects underway aimed to turn Price's "data banks" into reality. Since 1963, the National Bureau of Standards and various agencies had been working on a National Standard Reference Data System for organizing and disseminating chemical, physical, materials and mechanical property data from the published literature, government reports, and laboratory experiments.[44] The NSF also funded a number of discipline-specific information projects led by scientific societies and universities. For example, the American Chemical Society's Chemical Information System and the American Institute of Physics' bibliographic database of AIP journal articles.[4] In late 1967, three researchers at Bell Labs published an article called "The Future of

Scientific Journals" in which they proposed replacing the current paper-based journal system with one based on computers.[45]

Project Intrex: The future of engineering libraries?

In the Scanner's Corner column published in the May 1964 issue of the *Journal of Engineering Education*, Karen Takle mentioned a new technical information project at the Massachusetts Institute of Technology (MIT) called Minerva, directed by Carl F. J. Overhage, a physicist, engineering professor and recent director of Lincoln Labs, an MIT research center affiliated with the U.S. Department of Defense.[46]

Project Minerva's goal was to create a viable campus-wide communications system that would link researchers, library, and human resources. The project was cautiously supported by William N. Locke, director of MIT libraries, who had a background in machine translation and an interest in library automation. Over the following year, as Overhage began seeking funds from public and private sources, Project Minerva evolved into Project Intrex, short for "information transfer experiments."[47] Overhage's goal for Intrex was to create an experimental library that would "undertake a broad program of experimentation to learn how libraries might provide better access to recorded technical information."[47] Overhage was eventually successful in obtaining grants from several sources but primarily from the Council on Library Resources, which was affiliated with the Ford Foundation.

Overhage explained the project in an article published in *Science* in 1967.[48] Project Intrex aimed to generate solutions to what Overhage referred to as the "library crisis." There was too much published material, processed too slowly by the library, and hidden within cumbersome and inefficient paper-based retrieval systems. Such a situation, he warned, could ultimately lead to the demise of the library.

> "As each visit to the library adds to the accumulated annoyances of the user without producing an acceptably high yield of information, the crisis begins to display an ominous symptom: Faculty members and senior research workers, especially in the newer fields of science and technology, are staying away from the library. When that happens, it becomes obvious that the library no longer serves its intended function. When faculty members stay away, the library loses their interest, their support, their participation. Without these, budgets shrink and the facilities deteriorate."

Overage praised librarians for "struggling heroically to bring some semblance of order to this confused torrent," but believe that the only practical solution was the creation of an information system linking one or more indexed databases with full-text documents stored on microfiche or similar media. In September 1966, Overhage obtained administrative control over MIT's Barker Engineering Library, which he planned to use as a living laboratory after it was renovated. Not surprisingly, ESLC members were keenly interested in Project Intrex and invited project leaders to speak at several ASEE conferences in the late 1960s.

Project Intrex proceeded to create a database consisting of articles selected from engineering and materials science journals. Most of the work was done by MIT graduate students and librarians.

The database eventually grew to more than 20,000 records and was searchable by author, title and subject term. However, the project was plagued by hardware and software problems, cost overruns, and conflicts with funders and the library administration. Intrex's annual budget during the life of the project was immense, averaging more than 25 percent of the MIT libraries' operating budget.[49] By early 1970s it was clear that the project would not be able to fulfil its goals at a reasonable cost.

In 1973, Project Intrex was officially terminated and the Barker Engineering Library was reincorporated into the MIT library system, which was now led by Nathalie N. Nicholson, the new director of libraries.[50] Nicholson had been one of the founding members of the Engineering School Librarians Committee of New England, which was formed at the New England Section meeting at Dartmouth in October 1941. She served as the committee's first secretary in 1941-42 and remained a member of ESLC in the 1940s and early 50s. James M. Kyed was appointed Head of Engineering Libraries at MIT.[50] Beginning in 1974 he served in a succession of ELD positions, including chair from 1978-80.

ESLC becomes a division, 1966-67

In the fall of 1966 ESLC Chair Karen Takle and Vice-chair Joseph Kopycinski submitted a proposal for division status to the ASEE Board of Directors. It is not clear what motivated the ESLC leadership to seek divisional status on the eve of ESLC's 25th anniversary. There is no mention of the anniversary or any other notable event in the ESLC minutes of 1965 and 1966. Division status had been a goal of ESLC in the late 1940s, but there is no evidence that it was actively pursued prior to 1966. It is also possible that ESLC was inspired by the organization earlier in the year of an Engineering Division in the Special Libraries Association.

Joseph V. Kopycinski, c. 1965. Courtesy of the University of Massachusetts Lowell Library.

Joseph Kopycinski, the vice-chair, was the library director at the Lowell Technological Institute, now the University of Massachusetts Lowell. After serving in the U.S. Army during World War II, Kopycinski graduated from Lowell in 1948 with a BS in textile chemistry and then completed an MS in 1950. Shortly after completing his graduate studies he was appointed a librarian in the Institute's library. He earned an MLIS from Simmons College in 1960 and became library director soon after. He spent his entire career at Lowell and retired in 1986, only to pass away suddenly a few months later in January 1987. He was active in ELD throughout his career, serving in several roles including division archivist.[51]

In 1966 about 55 librarians were members of ASEE. The ESLC had 39 members, mostly librarians with a handful of representatives from corporations and government agencies. A. D. Booth from the University of Saskatchewan was the first Canadian member of ESLC. It is likely that the decision to see division status was driven by a combination of factors, first and foremost the possibility that the ASEE Board might disband the ESLC.

Since 1942, when it was first established, ESLC had operated more or less as a standing committee, conducting business on an ongoing basis under the leadership of a chair who was appointed to a two-year term. In the mid-1960s the ASEE Board adopted a new policy that limited the terms of all committees to three years, which were renewable at the Board's discretion. At the time, ASEE consisted of 23 divisions and 47 committees. It is possible that the Board introduced the rule with the intent of doing some organizational pruning, but it is not clear that it was targeting any specific committee. In fact, it appears that ASEE presidents George D. Lobingier, manager of education at Westinghouse, and Robert Roy, dean of engineering at Johns Hopkins University, were supporters of ESLC.

In a memo from August 1966, ASEE Executive Secretary W. Leighton Collins notified ESLC members of their new terms, which were staggered, and clarified the committee's mandate and organizational relationships.[52] ESLC's general responsibility was "to discuss and study those aspects of engineering library use, organization, information-handling methods, modern techniques, and tools of the future which will encourage the use of libraries by both students and faculties." Furthermore, the memo asked ESLC to undertake several specific tasks. ESLC was to "recommend a specific program for the education of the undergraduate engineer in the area of information storage and retrieval"; provide advice on the development of a curriculum for science and engineering librarians and aid in the recruitment of "promising well-grounded students;" and develop conference programs that would inform engineering faculty about "libraries, information resources, and their use." This program was essentially unchanged from 1964.

Another major factor in ESLC's decision to apply for divisional status might have been concerns that other ASEE groups, especially the Information Systems Committee and the Computers in Engineering Education Committee, were taking the lead in information storage and retrieval. The Information Systems Committee, which had been formed a few years earlier, had three sub-committees charged with studying computer education, indexing and abstracting, and the curriculums of information science programs. Engineering librarians were anxious about the possibility that new technologies would render their libraries obsolete. The ESLC proposal argued that "the rapid development of sophisticated hardware and new techniques in using the information resources make it *essential that the ESLC work with various ASEE divisions on an equal basis*." Karen Takle and others within ESLC might have calculated that division status could help ESLC reassert its role in developing new information systems and retrieval methods.

ESLC also suggested that division status would encourage more librarians to attend ASEE meetings and conferences, and possibly become members. ESLC was already operating as a division in many respects. In addition to a chair, it had a vice-chair, program chair, secretary, editor, section chairs and an executive committee.

The ESLC's proposal highlighted the quality of its recent programs at ASEE annual conferences and sectional meetings, its new newsletter and soon-to-be-launched series of literature guides. The guides were produced by the ESLC Bibliography Committee, chaired by Rita McDonald of Oregon State University. The first four literature guides were unveiled at the 1967 ASEE conference at Michigan State University. They covered chemical engineering, mechanical

engineering, civil engineering, and nuclear engineering.[53-56] Five additional guides covering industrial engineering, mining engineering, computer literature (authored by Karen Takle), electrical engineering, and transportation engineering were completed in time for the 1968 ASEE conference in Los Angeles.[57]

Other projects underway included a proposed survey on technical literature instruction provided to engineering students and engineering literature "state of the art" summer sessions. The survey proposal was drafted by two graduate students in the library program at San Jose State College (SJSC), under the guidance of Les Janke, chair of the SJSC library program, Karen Takle, and other members of ESLC.[58] The proposal was ready for submission to ASEE's Projects Operating Committee in June 1967, but there is no evidence that it was ever approved or conducted. It is also not known if any "state of the art" summer sessions were ever organized.

At the 1967 annual conference the ASEE Board granted ESLC's request. A few weeks later in July, Karen Takle announced the good news in a letter to members.[59] Division status appeared to have an immediate and positive impact on membership. By the end of 1967, the official membership had jumped to 74, although a number of these new members appeared to have been engineering faculty, not librarians. Three years later, in 1970, membership had increased to approximately 142.

In January 1968, ASEE published the final report of its Goals of Engineering Education study, a five-year project to investigate current trends and practices in engineering education and connect them to the future needs of engineers.[60] In regards to undergraduate education, the report made no specific recommendations regarding instruction in the use of libraries or information resources. However, it did recommend "a renewed attention to the humanities and to the whole area of communications." At the master's level, the report recommended that the student "should have had the opportunity--and the master's program may provide the first real opportunity-for experience under faculty supervision in critical and comparative reading of new engineering literature, both books and journal papers. He will acquire skill in efficient use of the library and of other resources." The report did not address library instruction at the PhD level.

In 1968, Dr. Robert Gaither, professor of and chair of the Mechanical Engineering Department at the University of Florida, became ELD chair. Gaither had been a member of ESLC for several years and was interested in library automation issues. In 1966-67, he and Robert Bristol, engineering librarian at the University of Virginia, compiled the first statistics on automation in engineering libraries. In 1972, Gaither and co-author J. R. Jones, a social sciences librarian, published an article in *Engineering Education* describing a pilot fax-based document delivery service between the University of Florida and the Orlando Public Library.[61] Gaither appears to have been the only engineering professor to have led ELD. However, he was not active in ELD for very long after his term was completed. He would go on to serve as the president of American Society of Mechanical Engineers (ASME) in 1982.

As the 1960s came to a close, ESLC members could celebrate some major successes. Thanks to the efforts of John McGowan, Warren Boes, Karen Takle and Thomas Minder, ESLC had organized excellent programs at ASEE conferences and established itself as an equal player in

information systems and library automation. It had engaged with the leadership of the ASEE and EJC in order to ensure that the views and expertise of ESLC members were considered in the development of engineering information systems. ESLC was now a division with a growing membership that reflected interests beyond traditional library matters. ESLC members were also active on the ASEE Information Systems Committee.

In 1969, the National Academy of Science-National Academic of Engineering joint Committee on Scientific and Technical Information published a new report on the information problem. Its recommendations included "a broad program in library education" with the goal of training all students and faculty in the "use of the increasingly complex array of existing library and information services."[62] Librarians, of course, agreed. In 1970, Thomas Minder, now an assistant director at the University of Pittsburgh, advocated for the integration of library skills into the engineering curriculum through existing courses. He noted that "[t]he librarian as information specialist must throw off his role as a 'service apart' from the classroom and become a full member of the academic organization."[63] The role of the librarian as faculty member would be discussed again at the 1971 ASEE meeting at the U.S. Naval Academy in Annapolis.[64, 65]

The theme of the 1970 ASEE conference, which was held at Ohio State University, was information processing systems. Approximately 31 ELSD members attended. On the ELD program were Fred Kilgour, director of the Ohio College Library Center (OCLC), Ralph O'Dette from Chemical Abstracts Service, Bill Woods, executive director, Engineering Index, Inc., and Charles Stevens from MIT's Project Intrex. Joseph Kopycinski of the University of Massachusetts at Lowell spoke about a new library orientation program recorded on video being used to introduce engineering students to the library. The Information Systems Committee, which included several librarians, sponsored a distinguished speaker session and demonstration devoted to information processes in engineering education.

Hard times: Engineering libraries face austerity in the 1970s

The period from the early 1950s to the late 1960s was a relatively prosperous time for academic libraries. Universities expanded to accommodate increasing numbers of Baby Boom generation students. Government funding for science and engineering research flowed to campuses, spurring the building or expansion of labs, research facilities, and libraries.

But by early 1970s there were signs that the good times were coming to an end. Government funding began to decline as the Nixon administration sought to curb government spending. Student populations began to level off and were projected to decline in the 1980s. In 1973, the first oil crisis, a stock market crash and the appearance of stagflation, rising unemployment and rising inflation, caused a major recession in the U.S. that lasted until early 1975. A second energy crisis in 1979 followed by another recession in 1980-82 prolonged the pain. In order to cope with the new fiscal realities, universities reduced library budgets dramatically.[66] Rising journal prices, especially in the sciences and engineering, and a weak U.S. dollar also caused much pain for academic libraries.[67]

The long-simmering debate between supporters of departmental versus centralized libraries heated up again. At the 1970 ASEE Conference, Edwin Posey, an engineering librarian at Purdue University, presented an argument against decentralized libraries, which was published in 1971 in the *IEEE Transactions on Education*.[68] Posey probably joined ASEE in the late 1960s and served as ELD program chair in 1971-72 and chair in 1972-73. In his paper Posey enumerated a long list of criticisms about departmental libraries, many of which had been raised repeatedly since the late 1800s. The main problem, of course, was that departmental libraries were expensive to staff and maintain. They also gave rise to excessive duplication and fragmentation of collections.

Posey's proposed solution was to merge small departmental libraries into a single Engineering Library. A few years later, he led the merger of six departmental libraries into Purdue's Siegesmund Engineering Library. Other universities also opted to merge departmental libraries. At the 1976 ASEE meeting at the University of Tennessee, which was attended by 36 librarians, Posey, Maurita P. Holland of the University of Michigan and R. A. Kenny of the University of Massachusetts Lowell participated on an ELD panel on "Moving and Merging Engineering Library Collections."[69] Posey was unable to attend the conference on account of a motorcycle accident, but he prepared a short paper that was read on his behalf.[70]

Posey noted that Purdue's engineering faculty, even members of the committee tasked with planning the merger, were deeply attached to their departmental libraries. In order to gain their support, the library highlighted the new technologies and services that would be available in a merged engineering library. The library promised to provide a microfiche book card catalogue and reader in every department so that faculty could located books without going to the library. The new library would have terminals for searching remote databases and computer-generated indexes. Professors could request books via telephone, which would be delivered to their offices. The library would also photocopy and circulate journal tables-of-contents and provide photocopies of articles on request.

Merging departmental libraries did reduce duplication of library services and collections and helped to reduce costs, but not enough to eliminate most library budget deficits. So many engineering librarians were forced to cancel journals and conference proceedings, and curb book purchases. In order to do this, librarians turned to bibliometrics and usage studies, a number of which were presented at ASEE conferences and published in *Engineering Education* during the late 1970s.

At the University of Michigan, the Engineering-Transportation Library tracked journal usage from 1974-75 and devised a formula to identify the low-use journals that would be the best candidates for cancellation. Foreign language titles accounted for 10 percent of the budget but 1.5 percent of use and translation journals accounted for 22 percent of the budget but only 1.6 percent of use. The journal budget was reduced by nearly one third.[71, 72]

At the University of West Virginia, librarians analyzed references in engineering master's theses in order to identify low-use materials. The study found that out of 3,002 references in 125 theses, nearly 67 percent were non-journal items. Consequently, WVU decided to cancel journal subscriptions in order to preserve and increase the book budget.[73]

Some science and engineering librarians argued for more government support for information dissemination in the form of subsidies to publishers and libraries.[74] Others warned against the trend in government to view information as a commercial commodity and called for revisiting the recommendations of the 1963 Weinberg Report.[75]

Another consequence of the economic hardships of the 1970s was that university administrators began demanding hard evidence of the library's role in education and research. Of course, librarians had been interested studying this relationship for many decades. In the late 1960s, John Lubans of Rensselaer Polytechnic Institute conducted a study of library non-users.[76] His work was based in part on an early unpublished 1953 study sponsored by ESLC and conducted by his mentor, Edward Chapman, head of the RPI library and a former chair of ESLC. The goal of Lubans' research was to better understand students' needs, especially students who used the library least, and how the library might meet them. He also argued that "[l]ibrarians need to take the offensive to show at the minimum that the economics of duplicated research is a serious matter."

Measuring the quality and effectiveness of libraries was a major theme at the 1978 ASEE conference at the University of British Columbia. That year, ELD organized two sessions on the topic. In 1977, Thomas Galvin and Allen Kent, the dean and associate dean of the Graduate School of Library and Information Science at the University of Pittsburgh, published a study of book circulation and journal use at Pitt. The so-called Pittsburgh Study was controversial among ELD members because one of the libraries in the study was the Engineering Library. Galvin and Kent claimed that only 58 (8.4 percent) out of 687 current journals accounted for all observed use during the study.[77] Based on their findings, they argued that libraries should greatly reduce journal subscriptions, transfer bound journals to lower-cost off-site storage and end to journal binding. The following year, Homer Bernhardt, the head of the Engineering Library at Pitt, presented a paper detailing major flaws in the study's methodologies and conclusions.[78] In rebutting the conclusions of Galvin and Kent, Bernhardt argued that librarians must develop better measures of quality and effectiveness. His paper made a deep impression on ELD members. When Bernhardt passed away suddenly in 1982, Hal Wiren of Ohio State University cited it as a "major contribution to the profession."[79]

As engineering librarians adjusted to the new age of austerity, ESLD continued to develop. ESLD had long had informal relationships with other organizations such as the Pure and Applied Sciences Section of the Association of College and Research Libraries. In 1972, ESLD initiated a formal liaison relationship with the Engineering Division of the Special Libraries Association (SLA). The first liaison was Bill M. Woods, editor at Engineering Index, Inc. who was a member of both SLA and ASEE, and the incoming chair of ESLD.[80]

Unfortunately, a few months later Woods was forced to resign from his position due to illness and was replaced by Morton Snowhite of the Newark College of Engineering. In early 1973, Woods wrote to John Rees, engineering librarian at Duke University and chair of the SLA Engineering Division, to inform him of these events and update him on ESLD's activities.[81] Woods reported that ESLD's literature guide series now included 15 published guides and that ESLD was considering a name change in order to better represent members from industry and

technical institutes. Within a few years ESLD changed its name to the Engineering Libraries Division (ELD). ELD membership had dropped to 143, of which about 30 were active.

Wood also noted that ESLD was keen to develop "guidelines for good engineering school library service" that the Engineering Council for Professional Development (ECPD) could use in its accreditation evaluations. The ECPD was founded in 1932 by seven engineering societies in order to provide accreditation for engineering and, after World War II, engineering technology degree programs. In 1980 ECPD was renamed the Accreditation Board for Engineering and Technology (ABET).

The lack of library guidelines in the ECPD accreditation process had troubled ESLC members since the 1960s. Warren Boes and John McGowan were particularly eager to develop more robust criteria during their terms on the ESLC. However, the issue appears to have languished until the mid-1970s. In June 1974, ELD submitted a formal proposal to include librarians on ECPD visiting committees, which was endorsed by the Council for Teaching and Learning, ELD's parent organization within ASEE, and forwarded to the ASEE Board for consideration.[82] The proposal argued that the "large size and complexity of modern academic libraries make it advisable that a skilled librarian be a member of each visiting committee" and requested that ECPD amend its procedures to include librarians as members of accreditation teams. Specifically, "[a] librarian chosen from the ASEE membership list or otherwise qualified to evaluate library collections, staff and service to the engineering disciplines, shall be a member of each visiting committee." There is no record in the ELD archives that the ASEE Board approved the proposal. In fact, the lack of any further mention in the newsletter and minutes suggests that it was not adopted.

In 1975 ELD created an Accreditation Committee and tasked it with improving the accreditation process as it related to libraries.[83] The Committee developed a proposal to add a number of library-related questions to the ECPD/ABET questionnaire. ABET rejected the proposal as being too burdensome, but later incorporated a few selected questions.

In the meantime, ELD sought to improve the quantity and quality of library data available to engineering faculty and accreditation teams. In 1975, it published the first ELD Membership Directory and Guide to Resources. In 1979, after many years of lobbying by ELD, engineering library data was included in the annual Engineering College Research and Graduate Study, which was published in the March issue of *Engineering Education*.[84] The data collected included the number of professional librarians and other staff; the number of volumes and current periodical subscriptions; the annual materials budget; the availability of computer database search services; and whether the engineering library was a separate facility.

However, collection of the data proved to be problematic. Some institutions did not submit data or submitted incomplete data. Although most ELD members agreed that the data was useful, some engineering schools lobbied to discontinue its collection citing difficulties in obtaining the data and questioning its accuracy and validity. ELD chair James Kyed of MIT persuaded Edward Segner, the chair of the Engineering Research Council, and Charles Elliot, chair of the Publications Committee, to continue the program for one more year while the problems were

investigated.[85] However, no library data appears to have been collected in the 1980 or subsequent surveys.

ELD in the 1980s

During the late 1970s and early 1980s, ELD sessions began to focus more on computer and information technology. Since the 1960s, ELD had cultivated a close working relationship with the Information Systems Committee. A number of ELD members, including Mary McElroy of Cornell and Homer Bernhardt of the University of Pittsburgh, were active in ISC. However, there were still jurisdictional scuffles between ELD and ISC. In 1979 when the ISC wanted to update its bylaws in connection with its proposal for division status, ELD insisted on language specifically excluding information systems as applied in libraries.[86]

At the 1979 ASEE conference at Louisiana State University, ELD and ISC collaborated on a joint session where ELD members would demonstrate a conference proceedings database based on Lockheed's DIALOG system.[87] The purpose of the session was to introduce engineering faculty to online database searching. Conference attendees could query the system (with the assistance of librarians) using keywords and retrieve a list of sessions that matched their interests. The session was repeated at the 1980 ASEE conference at the University of Massachusetts, Amherst.[88]

By 1980 most academic libraries offered database searching services. The 1979 ELD program had a session on online databases and a database searching workshop conducted by Maurita Holland, director of the Engineering Library at the University of Michigan, and Dale Rummer, professor of electrical and computer engineering at the University of Kansas.[89, 90] Another session focused on the impact of computerization on library consortia.[91] A few years later, in 1984 and 1985, ELD offered sessions on teaching end-users how to search online databases, including one session chaired by Karen Takle.[92-96]

New forms of communication were emerging. In 1983, the ELD executive committee discussed the possibility of using e-mail to communicate. The idea was rejected because few librarians had access to a terminal where they could read e-mail or could not afford a private e-mail service. By the mid-1980s, CD-ROM databases were emerging as alternatives to online databases.[97] During the final years of the decade, ELD organized many programs on workstations, software, the internet and electronic journals.[98-101] Engineering librarians were also interested in exploring new ways to serve the information needs of local industries.[102-105]

In the mid-1980s the ASEE board became concerned about declining membership. In 1985 ASEE membership was 9,300, substantially down from its peak of approximately 13,000 members in the late 1970s. The average age of ASEE members was 57. In order to address the problem the board instructed each division to develop a member recruitment plan. Divisions with fewer than 200 members were cautioned that failure to recruit more members might result in their disbandment. On paper ELD had approximately 160 members, but the executive committee estimated that only 20-30 were active.

In 1986 the ELD executive committee, chaired by Don Richardson of Worcester Polytechnic Institute, developed a plan to target librarians at the approximately 300 institutions with accredited engineering programs. The Membership Committee drafted a form letter inviting librarians to join ASEE and a brochure highlighting ELD's mission and activities. A year later, in 1987, ELD's membership was down to 152, of which 78 selected ELD as their primary division. However, persistent problems with ASEE's division member tracking system made it difficult to obtain an accurate membership count. In light of the ASEE board's threat, ELD's future must have seemed bleak.

Fortunately, ELD's visibility within ASEE was enhanced in 1986 when Maurita Holland was elected chair of the Professional Interest Council (PIC) IV, ELD's parent organization. Holland joined ASEE in the mid-1970s and served as ELD chair in 1984-85. She was the first (and possibly only) librarian to serve on the ASEE board. In her role as PIC IV chair, Holland was well-positioned to lobby for ELD's interests. At the 1987 ASEE conference at the University of Nevada, Reno, she reported that the ASEE board had agreed to allow ELD to continue as a division even though its membership was well below 200. She noted that ELD's literature guide series was much valued by ASEE. ELD finally launched its membership drive in 1988-89.


Left: ASEE and ELD logos from the 1970s and early 1980s.

Over the next few years, ELD's membership increased moderately, reaching 179 in 1990. By 1995, however, it had dropped back to 153. In the late 1990s, membership began to increase again and by 2000 there were approximately 185 ELD members. This trend continued over the course of the next decade and was largely driven by an influx of new librarian and vendor representative members. ASEE improved its membership system and by 2001 was able to provide accurate division member counts. ELD membership peaked in 2008 at 254 and has since declined to approximately 211, although that number could be slight higher due to late renewals. As of the spring of 2016, ELD's membership included 172 librarians (81.5 percent), 26 vendor and publisher employees (12.3 percent), 8 engineering faculty (3.8 percent) and 5 retired members (2.4 percent).
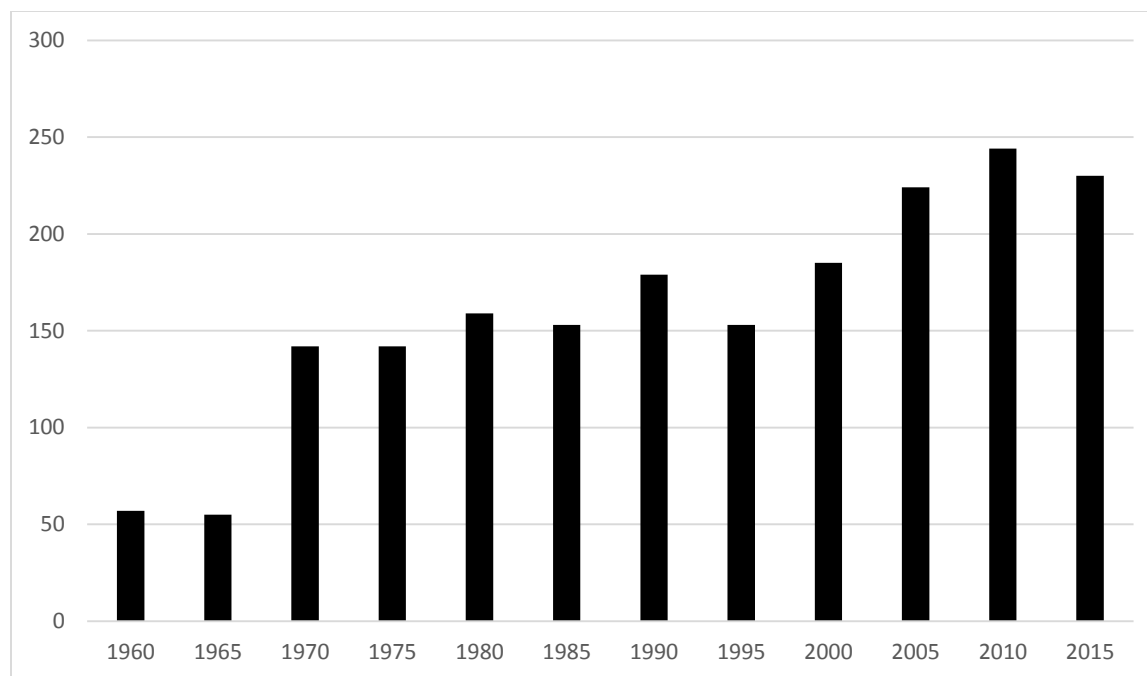
Table 1. ELD Membership in five year increments, 1960-2015.

In the mid-1980s, the ELD Standards Committee began compiling statistics on engineering libraries. The first edition was published in 1986. A second edition with more comprehensive information was published in 1990.[106]

ELD continued lobbying ABET to expand librarian participation in the accreditation process. In 1986, ABET finally agreed to allow, on a trial basis, librarians to participate in ABET site visits as observers provided they covered their own expenses. The three members of the Accreditation Committee, Karen Andrews of the University of California, Los Angeles, Wendy Culotta of California State University, Long Beach, and Jay Waddell of California Polytechnic State University, were selected to participate in the trial. During the 1986-87 year, each of the librarians participated in several site visits. While the pilot certainly raised the visibility of librarians during the accreditation process, it had limited success in addressing problems related to the library. During one site visit, the observer librarian noted that student reports had few references and none to scholarly journals, conference proceedings, government reports or trade magazines. The site visit report, however, found no problems with students' written communication skills.[83]

In October 1987, David R. Reyes-Guerra, executive director of the Engineering Accreditation Commission (EAC) of ABET, wrote to Wendy Culotta, chair of the ELD Accreditation Committee.[107] He reported that the EAC was "most favorably impressed" with the contributions of the librarians as members of the site visit teams. However, he informed her that the EAC had decided to discontinue the pilot. He invited ELD to submit further suggestions for questions to ask during visits and in the self-study questionnaire, as well as proposals for changes to the criteria. In explaining the EAC's decision, Reyes-Guerra stated "the engineering library is most important to the well-being of the engineering program; however, it is one of the supports

and not the primary focus of the program… the EAC must be careful not to over burden the program and make certain any specific requirements are weighed in terms of the total effect."

At the 1988 ASEE conference, ELD organized a panel on accreditation which included Reyes-Guerra.[108] Unfortunately, there is no transcript of the discussion. During the 1988-89 ABET cycle, ELD member Dorothy Byers of the University of Cincinnati participated in an ABET site visit at Arizona State University, but this appears to have been a one-time invitation. In 1990, ELD submitted a proposal to ABET to add criteria relating to information retrieval skills, information literacy, and proper citation formats.[109] Again, ABET rejected the proposal.

Some librarians were able to work within the ABET process to successfully lobby for more formal instruction. During an ABET site visit at Arizona State University in 1979, librarians suggested developing a course on engineering information resources, an idea which was endorsed by a member of the ABET team.[110] Two years later, in 1982, the course was offered for the first time. By the mid-1980s, a number of engineering schools had formal engineering information courses. In 1987, a survey of ELD members found that twelve universities had for-credit engineering information courses, but at only five was it a required course.[111] At ten universities the courses were taught by librarians and engineers were the instructors at two. Fifty six schools responding to the survey did not have formal courses but reported a variety of lectures, presentations and orientations.

ELD in the 1990s: From BITNET to the web

As computer technology continued to evolve in the early 1990s, ELD members adopted new forms of communication. By the late 1980s, many ELD members were using fax and sharing their BITNET e-mail addresses. In August 1991, ELD established its first e-mail list, ELDNET-L, moderated by Mel DeSart of the University of Illinois at Urbana-Champaign. By the end of 1991, ELDNET-L had about 100 subscribers. A second list, ELD-L, for use by ELD members only appeared in 1998. Both lists grew substantially during the 90s and early 2000s. As of 2016, ELDNET-L had 637 subscribers and ELD-L had 233.

An electronic version of the ELD newsletter debuted in December 1991. The last print edition was mailed to members in December 1998. A few months later, in 1999, the ELD Membership Directory was distributed in electronic format for the first time. The rise of the web in the mid-1990s created new opportunities for librarians to communicate with their users and each other. The first library websites appeared in 1994 and by early 1996 ELD had its own homepage hosted on the ASEE website.[112] A few years later, the ELD homepage grew into a full website hosted at Cornell University, and administered by Jill Powell, engineering librarian, from 1998-2004.

By the mid-1990s, most engineering libraries offered numerous databases on CD-ROM and locally loaded databases. In 1997, Andy Stuart of the University of Missouri—Rolla, ELD chair in 1996-97, marveled at how quickly electronic databases had replaced print indexes. He acknowledged that the dramatically changing environment created new risks and opportunities for engineering and science librarians, but expressed confidence in their ability to meet these challenges. He emphasized that ELD was the "right group at the right time to assist these activities and ventures…"[113] A year later, Charlotte Erdman of Purdue University and ELD

chair in 1997-98, raised concerns that the new electronic environment was creating a world of "haves and have-nots" and encouraged ELD members to work with engineering faculty to find "solutions and fair pricing!"[114] By the late 1990s, it was clear that the future of engineering information would be on the web. CD-ROM databases were superseded by web-based databases, journals and e-books.

ELD also took a leadership role within ASEE in promoting electronic publishing, which was rapidly expanding in the late 1990s. In 1996, ELD sponsored a mini-plenary on the topic at the ASEE conference in Washington, D.C.[112] In 1999, ELD became involved with two electronic publishing initiatives, SPARC and J-STOR, in hopes of making available electronic backfiles of engineering journals.[115]

ELD established several awards in the 1990s. The first, in 1990, was the Homer I. Bernhardt Distinguished Service Award, named in honor of Homer Bernhardt, the head of the Engineering Library at the University of Pittsburgh and a long-time ELD member who passed away in 1982. The award is given in recognition of exceptional contributions to the "advancement and development of excellence in engineering libraries." In 1998, ELD established awards for the Best Publication Best Reference Work. The Best Publication Award is given for an outstanding paper or non-reference book in engineering information. The Best Reference Work recognized the best new reference work in engineering. In 2010 it was changed to the Innovation in Access to Engineering Information Award. In 2006, ELD established a Best Poster Award which is given for the best poster presented at the ASEE annual conference. Complete lists of award recipients can be found on the ELD website.

Vendors and publishers had been members in ELD dating back to the 1950s. However, they were few in number and not especially active. In the 1990s, especially after 1995, the number of vendor and publisher representatives in ELD grew significantly. This gave rise to new opportunities for collaborations with ELD. ELD eventually established a Development Committee which works with vendors to secure funding for various ELD events, awards and travel stipends.

ELD in the 21st Century: Bright or bleak?

In the early years of the 2000s, ELD continued to grow and adapt to the changing information environment. The migration from print to electronic publishing was not always a smooth road. A number of ELD members raised concerns about the quality of electronic journals and the usability of electronic products. In 2003, ELD established a task force to develop and promote best practices for electronic resources, chaired by Christy Hightower of the University of California, Santa Cruz. The task force developed a "punch list" of best practices that was shared widely with publishers and librarians.

ELD members continued to work on digital publishing initiatives. One of the best known and most successful is TRAIL, the Technical Reports Archive and Image Library. TRAIL was conceived in 2003 by a group of librarians led by Maliaca Oxnam of the University of Arizona as a project to digitize U.S. government technical reports. From 2003-2007 recruited partners and

funders who would support the project. A pilot site became operational in 2006. By TRAIL's tenth anniversary in 2016, the number of scanned technical reports had surpassed 50,000.

The ELD literature guide program continued to be active. In 2003, the first electronic literature guide, covering industrial ergonomics, was created by Nestor Osorio of Northern Illinois University. In 2003, the ELD membership approved a new logo. The ELD website moved from Cornell to the University of California, Davis and then to the University of Washington, where it currently resides.

ELD Logo, 2003-2017

The ELD liaison program, which had started in the 1970s with the SLA Engineering Division, was revived in 2001. The purpose of the program was to improve communication and facilitate collaborations with related organizations and increase ELD's visibility within the broader science, technology and engineering library community. At its peak, the program had nearly a dozen liaisons to organizations such as SPARC, ACS Chemical Information Division, IATUL (International Association of Technical University Libraries), PIUG (Patent Information Users Group), and several SLA divisions. Recruiting and retaining liaisons proved difficult, however, and in 2015 the program was discontinued.

ELD continued to organize conference programs that were very well-received. The number of ELD members attending the ASEE annual conference increased substantially. It was not uncommon to see more than 100 members at ELD programs. However, the number of sessions jointly sponsored with other divisions declined. ELD sponsored several distinguished speakers including Roy Tennant of the California Digital Library in 2004, Lawrence Lessig of Stanford University in 2005, Richard T. Sweeney of the New Jersey Institute of Technology in 2008, and Michael Carroll of American University in 2013. The number of ELD members co-authoring papers with other librarians and engineering faculty increased during 2000-2010.[116] Not surprisingly, information literacy was the most common theme in ELD conference papers.

ELD members continued to be interested in information literacy issues and a special interest group was formed in 1993. Nearly 20 years later, in 2011, the ELD executive committee voted unanimously to adopt the Association of College and Research Libraries, Science and Technology Section's Information Literacy Standards for Science and Engineering/Technology, with an additional standard addressing the entrepreneurial information skills in engineering.

Starting in late 2007-08, a series of global financial and economic crises known collectively as the Great Recession precipitated another painful period of austerity for academic libraries. The period from 2008-2012 was marked by declining budgets, e-resource cancellations, library mergers, and staff reductions. Desperate to reduce costs, many universities considered merging or closing libraries. Science and engineering branch libraries appeared to be the most vulnerable due the shift from print to electronic resources.

Science and engineering libraries were under pressure long before 2007. In 1998, 90 years after it first opened, the venerable Engineering Societies Library in New York City closed and its collections transferred to the Linda Hall Library in Kansas City.[117]

In 2009, budget cuts at the University of California, Davis threatened to close the Physical Science and Engineering Library.[118] At the University of British Columbia, the Science and Engineering Library and two off-campus hospital libraries were merged with the Woodward Biomedical Library in 2012-13.[119] In 2013, the University of Saskatchewan announced plans to consolidate seven campus libraries, including the engineering library, into three.[120] The University of California, San Diego merged its Science and Engineering Library with three other branch libraries.[119]

The transition from print to digital resources, especially journals, and declining use of print materials also raised questions about the need to maintain physical science and engineering libraries. Librarians faced increasing pressure from university administrators to move collections of older, less-used bound journals and books to storage in order to reduce costs and repurpose library space for classrooms, group study rooms, labs, 3D printer workshops (makerspaces), and offices. At some universities, engineering libraries were located in outdated and poorly maintained facilities. Many engineering librarians welcomed the chance to reinvent their libraries along modern lines.

One of the first engineering libraries to be transformed was the Terman Engineering Library at Stanford University. In 2010, the library reopened in its new location in the Jen-Hsun Huang Engineering Center, in a space less than half the size of its former location.[121] Soon after, Cornell's Engineering Library was converted into a digital library and its print collections moved to storage and the main library.[122] The University of Texas at San Antonio opened its "bookless" Applied Engineering and Technology Library in September 2010.[123] In 2013, the James B. Hunt Library, which houses collections and services focusing on engineering, science, technology and textiles, opened at the North Carolina State University.

Library stakeholders did not always respond well to library mergers. In 2014, students and faculty protested over plans to close the engineering and math, physics and astronomy branch libraries. At Michigan State in 2015, students opposed plans to repurpose the Engineering Library and move its collections to the main library.[124] In 2016, faculty at the University of California, Santa Cruz objected to the downsizing of the print collection in the Science and Engineering Library.[125]

Although some librarians may have mourned the passing of the traditional engineering library, many embraced new opportunities in research data management, entrepreneurship support, digital scholarship, 3D printing, research metrics, and online instruction.

The global economic crisis and recession also roiled ASEE. After peaking in 2010 at approximately 14,000, membership declined and a structural deficit appeared that pushed the annual operating budget deep into the red. The ASEE board increased membership dues and conference fees in order to mitigate the problem. In 2014-15, some ELD members began to express concerns about the increasing cost of participation in ASEE and the lack of financial transparency. Others felt that ELD was becoming marginalized with ASEE. Several times in the 2000s ELD had nominated members to be candidates for PIC IV chair, but the ASEE Nominating Committee had rejected them.

As of 2015, ELD's membership was distributed across ASEE's North America zones and sections as displayed below. The greatest number of members is concentrated in the three sections comprising ASEE's Zone II, Southeastern, North Central and Illinois-Indiana. Nearly 63 percent of ELD members are located in the six sections east of the Mississippi and Great Lakes.
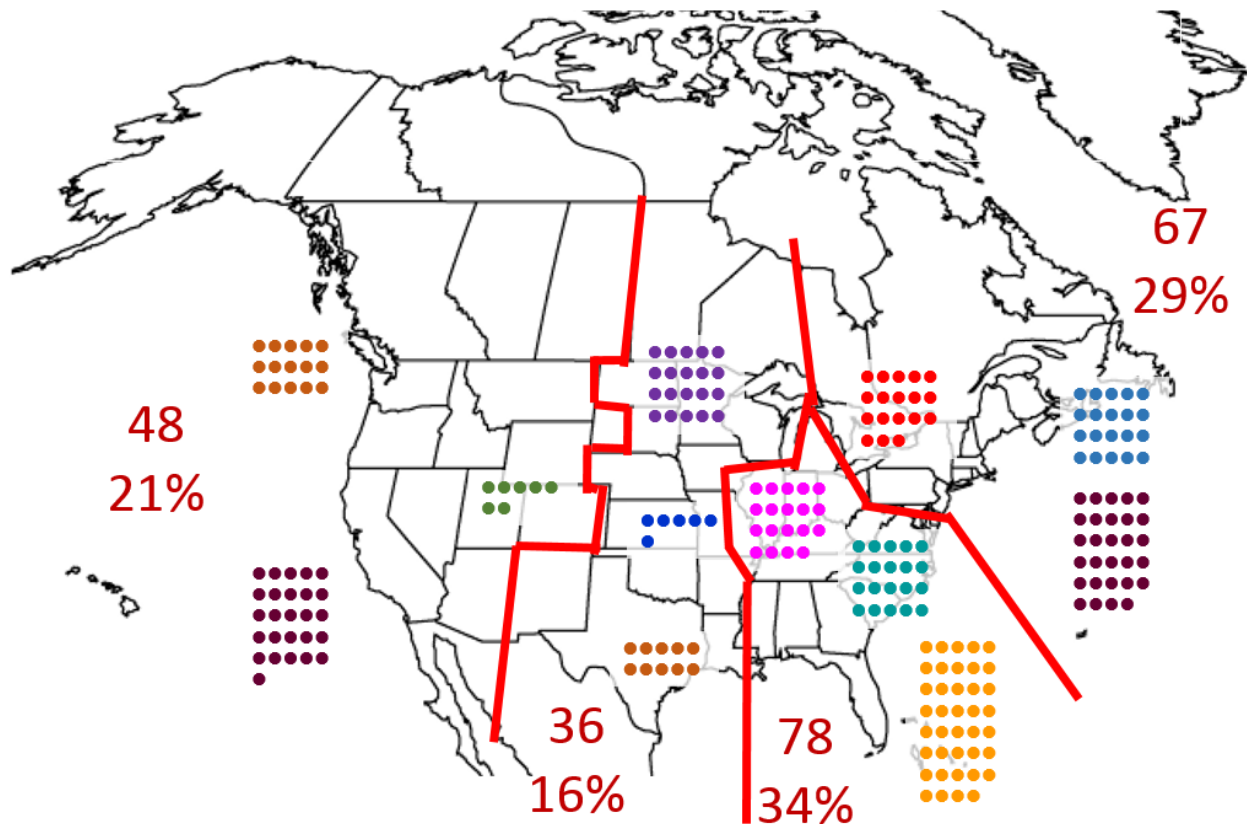
In 2015, the ELD formed a Visioning Task Force to generate ideas for ELD's future prospects, which was presented and discussed at the ASEE annual conference in Seattle. In the summer of

2015, the ELD executive committee held a referenda on ELD's future direction. ELD members were asked to vote for one of three choices: remain in ASEE; leave ASEE and form a new organization; or abstain. The vote was conducted in July and approximately 35.6 percent of the membership cast ballots. By a margin of approximately 5 to 2, ELD members voted to remain in ASEE. A substantial minority voted to abstain. The issue was probably one of the most divisive in ELD's history and following the vote several ELD members resigned.

In 2015, ELD nominated Michael White of Queen's University to be a candidate for PIC IV chair. The ASEE Nominating Committee approved the nomination and White appeared on the 2016 national ballot but was not elected. The events of 2015-16 raised the visibility of ELD within ASEE and drew the attention of the ASEE Board to ELD concerns.

Conclusion

According to the ELD bylaws, the objectives of the division are as follows.

1. "To initiate, support, and promote the exchange of information in engineering through leadership within ASEE and cooperation among librarians, information specialists, engineering information providers, educators, researchers, practicing engineers, and professional organizations;
2. To promote and strengthen the role of the library/information center as an integral part of engineering education; and
3. To support the objectives of the ASEE Professional Interest Council (PIC) of which the Division is a member."[126]

Over the past 50 years, ELD has pursued these goals amid a constantly and often rapidly changing technological landscape, in good times and difficult periods. It has had many successes and some setbacks. In the early 1960s, when technological change and engineering faculty indifference to library instruction threatened to render libraries irrelevant, ELD under the leadership of John McGowan, Warren Boes, Karen Takle and Thomas Minder reasserted and strengthened the role of librarians within ASEE and in engineering education. Despite the financial challenges of the 1970s and early 80s, ELD continued to push for a greater role in engineering instruction and accreditation. Its efforts to promote information literacy in ABET criteria and to have librarians as members of ABET teams were not successful. But ELD continues to advocate for information literacy. As technological change accelerated in the 1980s and 90s, ELD members embraced it and became leaders within ASEE in adopting new technologies and techniques for teaching information resources. New opportunities and challenges in the 2000s buffeted ELD. But it seems likely that as academic engineering librarianship evolves, ELD will continue to be a vital and relevant force.

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Appendix A. Chairs of the ASEE Engineering Libraries Division, 1960-2017

Since 1960, 48 people have served as chair of the Engineering School Libraries Committee/Engineering Libraries Division. Of these, four have been from Perdue University and two each from Drexel University, University of Michigan, Texas A&M University, and Worcester Polytechnic Institute.

Chair (Years)	Institution
McGowan, John P. (1960-62)	Franklin Institute
Boes, Warren. N. (1962-64)	Polytechnic Institute of Brooklyn / Syracuse University
Takle, Karen G. (1964-66)	Drexel Technological Institute / IBM San Jose
Kopycinski, Joseph V. (1966-68)	Lowell Technological Institute
Gaither, Robert B. (1969-70)	University of Florida
Roberts, Elizabeth (1970-71)	Washington State University
Wilcox, Virginia (1971-72)	Colorado School of Mines
Posey, Edwin (1972-73)	Perdue University

Snowhite, Morton (1973-74)	Newark College of Engineering
Brown, Carmen (1974-76)	Worchester Polytechnic Institute
Arnold, Mary Jo (1976-78)	Ohio State University
Kyed, James M. (1978-80)	Massachusetts Institute of Technology
Andrews, Karen (1980-81)	University of California, Los Angeles
Jackson, Kathy (1981-82)	Texas A&M University
Vivan, Zanier (1982-83)	University of New Mexico
Holland, Maurita P. (1983-85)	University of Michigan
Richardson, Donald (1985-87)	Worchester Polytechnic Institute
Wetts, Hazel (1987-88)	University of Southern California
Fries, James R.(1988-89)	Dartmouth College
Byers, Dorothy (1989-90)	University of Cincinnati
Borovansky, Vladimir (1990-91)	Arizona State University
Waddell, Jay (1991-92)	California State University, San Luis Obispo
Gibbs, Paige (1992-93)	University of Massachusetts, Dartmouth
Mullen, Cecilia (1993-94)	San Jose State University
Gass, Steve (1994-95)	Stanford University
Schwarzwalder, Robert (1995-96)	University of Michigan
Stewart, Andrew (1996-97)	University of Missouri
Erdmann, Charlotte (1997-98)	Purdue University
Brin, Beth (1998-99)	Idaho State University
Curl, Sheila (1999-2000)	Purdue University
Musser, Linda (2000-01)	Pennsylvania State University
DeSart, Mel (2001-02)	University of Washington

Sneff, Gretchen (2002-03)	Temple University
Thompson, Larry (2003-04)	Virginia Tech
Shimp, Andrew (2004-05)	Yale University
Powell, Jill (2005-06)	Cornell University
Thomes, Kate (2006-07)	University of Pittsburgh
Bhatt, Jay (2007-08)	Drexel University
Van Epps, Amy (2008-09)	Purdue University
Teleha, John (2009-10)	North Carolina Agricultural & Technical State University
Heyer-Gray, Robert (2010-11)	University of California, Davis
White, Michael J. (2011-12)	Queen's University, Kingston, Ontario
McGee, Doug (2012-13)	University of Pennsylvania
Popescu, Adriana (2013-14)	Princeton University
Sapp Nelson, Megan (2014-15)	Purdue University
Rauh, Anne (2015-16)	Syracuse University
Beard, Craig (2016-17)	University of Alabama, Birmingham
Neville, Bruce (2017-18)	Texas A&M University