COLLECTION OVERVIEW

MATHEMATICS, COMPUTER SCIENCES, TELECOMMUNICATION

I. SCOPE

The mathematics, computer sciences, telecommunication, and artificial intelligence overview includes mathematics (LC Class QA1-QA74, QA77-QA939), computer science (LC Class QA75-76), telecommunication technologies (including telegraph, telephone, radio, radar, television and cable net works (LC Class TK5101-TK6720), computer design and electronics (LC Class TK7885-TK7895), and Artificial intelligence and information theory (LC Class Q334-390) and associated materials classed in bibliography, indexes, and abstracting services (LC Class Z).

II. SIZE

The Library's collocations of materials in these areas are substantial with the count running to more than 283,000 titles. Additional titles fall within the Z classification and materials held in other custodial units.

III. GENERAL RESEARCH STRENGTHS

The major strengths of the Library's collections in mathematics, computer sciences and telecommunication lie in their breadth, depth, and diversity. They are diverse in scope, format, and language. A significant number of the Library's serial holdings in mathematics are in European and Asian languages and have been issued by the major mathematical institutes, societies, associations, and learned institutions, including the London Mathematical Society, the Akademie der Wissenschaften, the American Mathematical Society, and the International Congress of Mathematicians. The Library has been able to acquire many of the expensive cover-to-cover translations of these works through copyright deposit and has been able to make the work of Russian mathematicians, considered to be among the best in the world, increasingly available to researchers and scholars. In a 1985 *RLG Verification Study of Mathematical Journals,* the Library ranked sixth in the country in collecting basic, research, and historical mathematical journals; its historical collection was ranked second.

The Library has also been able to acquire roughly 90 % of the publications of major professional associations in the fields of computer science and artificial intelligence. These included the Association for Computing Machinery (ACM), the Society for Industrial and Applied Mechanics (SIAM), the Institute for Electrical and Electronics Engineers (IEEE), and the American Association for Artificial Intelligence (AAAI). These materials, acquired by the copyright, the Library's exchange and overseas programs, and purchase are collected primarily at a research level. The

Library provides access not only to abstracting and indexing services in electronic format, but also to full text databases when available.

IV. AREAS OF DISTINCTION

The Library holds important first editions of the works of many outstanding mathematicians and number of seminal books in the field of mathematics. Among these is a copy of the first printed edition of Euclid's *Elements*, a work for which there have been over one thousand editions as well as Archimedes' *Opera, Quae Quidem Extant, Omnia* (1544), the first complete edition of his work. The library has a 1561 edition of Robert Recorde's *Grounde of Artes*, said to be the most influential English textbook of the 16th century. The Library also possesses many works by prominent women mathematicians such as Mary Everest Boole, Emile du Chatlet, Mary Somerville, and Emmy Noether as well as Maria Gaenta Agnesi's *Instituzioni Analitiche ad uso della Gioventu' Italiana* (1748), which is said to be the first surviving mathematical work written by a woman. Also deserving attention are the Library's collections of major works of influential mathematicians such as the Bernoullis, Leonard Euler, Johann Carl Friedrich Gauss, David Hilbert, Joseph Louis Lagrange, William Oughtred, Bernard Riemann, John Wallis, and Karl Wisstrauss, the papers of Oswald Veblen, Cark Eckhart and Lewis Reeves Gibbs, as well as the works of notable American mathematicians Eliakim Hastings Moore, E. H. Moore, George David Birkhoff, R. L. Moore, and George Bruce Halsted.

Another area of distinction is the collection of early American mathematical books and periodicals published before 1900. Among these is a 1729 copy of Isaac Greenwood's *Arithmetick Vulgar and Decimal: with the Application thereof to a Variety of Cases in Trade and Commerce*, credited as being the first English mathematical textbook written by an American and published in what is now the United States. A first edition of Nicolas Pike's A *New and Complete System of Arithmetic, Composed for the Use of Citizens of the United States* (1788) and many of its revisions are also held by the Library. Among its early American mathematical periodicals are the brief, but notable, runs of *Cambridge Miscellany of Mathematics, Physics, and Astronomy*, the *Mathematical Correspondent*, *Mathematical Diary*, *Mathematical Miscellany*, and *Mathematical Monthly*. The *Cambridge Miscellany* has the distinction of being the first American mathematical periodical edited by scholars.

In the area of the history of computers, data processing, and technology, the Library has significant holdings. It holds the works and the papers of Herman Hollerith, John von Neumann, Vannevar Bush (analog computing), Claude Elwood Shannon (information theory), and John W. Backus (FORTRAN). These collections are complemented by several originative papers in the field of information theory that were first published as technical reports and are part of the Library's collections. The growth of the telecommunication industry and its history is documented through the papers of Samuel F. B. Mores and the Bell Family papers, the Lee De Forest papers (radio/sound recordings), and those of Harold Sunde (RCA engineer). Some of the Morse papers and the Bell papers can be accessed through the Library's American Memory website.

One of the Library's strengths in the history of computer science is the fact that it holds all editions of books describing a programming language, an operating system, a storage device, not simply the most current edition and that its abstracting and indexing services, journal literature, technical reports, and electronic resources chronicle the development of computer and information science from its inception. The Library's Collection Policy Statement on Computer Science, Telecommunication, and Artificial Intelligence, the Collection Policy Statement on Technology, and the Collection Policy Statement on Science--General have encouraged the wide-range of computer-related materials that have been and are presently being acquired to make the Library's collections among the best in the world. A case in point: *The Chip: How Two Americans Invented the Microchip and Launched a Revolution* (1984) was written in its entirety in the Library's Science and Technology Reading Room.

One should not overlook the unique mathematical material in the Library's area studies collections. One noteworthy example is the Asian Division's collection of 403 titles of Japanese traditional mathematics called *wasan*.

V. ELECTRONIC RESOURCES

Electronic resources are an integral part of the mathematics, computer science, telecommunication, and artificial intelligence collections of the Library of Congress. Many of these resources have been incorporated into the online catalog, while others are accessed through the Electronic Resources area of the Library of Congress web site. Programs such as *Find It! Open URL Resolver* continue to work toward a seamless interface between records for electronic and print collections by improving linkages between bibliographic citations and full text accessible to Library staff and patrons. Mathematical, computer science, artificial intelligence, and telecommunication-related materials of all types, including electronic resources, can also be identified through Library of Congress finding aids and bibliographic guides, which themselves are collected on the Science Reference Section web pages.

As certain materials migrate from print to digital-only format, they are frequently collected into the Electronic Resources area of the Library, within the OPAC as an electronic link added through the Tracker system, or both. These sources may be freely available, or may require a subscription, as in the case of many electronic resources. Both are actively collected, and will continue to be collected in the future.

Digital format has increasingly blurred the line between databases of citations, abstracts and full text, so that a given database may provide what is essentially an electronic journal for one title, while providing a citation, with no text, for another journal. Differences in periods of coverage also contribute to making a precise assessment of the number and nature of available electronic resources somewhat difficult, but several reliably strong sources for electronic materials in the area of human nutrition and food technology can be identified. The list titled E-Journals in Physical Sciences and Mathematics and E-Journals in Engineering & Applied Sciences (in Electronic Resources) can be helpful in identifying titles. Particularly useful titles include the subscription databases: *JSTOR*,

Academic Search Premier, Applied Science and Technology Full Text, ERAM, Inspec, Web of Science, HistSciMedTech, Digital Dissertations, Information Science & Technology Abstracts, and *CSA Technology Research Database*.

Freely available electronic resources collected by the Library, that often have materials of interest in the area of the mathematics and computer sciences include *Zentralblatt Math, Historical Mathematics Monographs, Mathematics Didactics Database, Computing Research Repository, Project Euclid* and *Infotech Trends*. Freely available resources such as these sometimes demonstrate that the overlap between web sites and online databases can again blur distinctions. Maintaining functioning links becomes part of the process of collection development and maintenance, and issues related to the capture and archiving of web sites continue to be debated.

Since many books with CDs are received through copyright deposit, many are collected for the collections. Indeed, many of the standard reference tools in the sciences include a CD in a pocket. Because the technology for viewing these CDs is not generally supported in the Library's reading rooms, except in the Machine Readable Collections Reading Room (MRC), these materials must be requested and viewed in MRC. Podcasts and webcasts produced by the Library are currently collected on the Library of Congress web site. Increasingly, links to these materials at other web sites are being collected, and these materials can be expected to become more integral to the electronic resources collections in the future.

Many issues related to the collection of certain types of electronic resources remain to be resolved; for example, resolution of questions surrounding copyright deposit of electronic media will facilitate collection activities of these materials in the future. The collection of electronic materials necessarily raises other questions, including the perennial problems with which most libraries continue to deal, namely, how to provide enough space for the collections and how to maintain access to materials over the long term.

VI. WEAKNESSES/EXCLUSIONS

While the Library does not comprehensively collect mathematics textbooks, it does collect a selection to provide some idea of the type of text used during a specific time period. However, its collection does not give a complete picture of the texts used to educate at the elementary, secondary, or college level. The Library does not collect teacher's manuals or the solution books that frequently accompany the teacher edition textbooks. The Library also does not collect heavily in juvenile works or in works devoted to mathematic recreation.

One of the most important deficits is the Library's inability to capture mathematical and computer conferences, preprints, and papers being published in electronic format only. In computer science, the Library is missing gray literature from universities, industrial laboratories, R&D firms, such as IBM and AT&T. Unless it is received through the National Technical Information Service, the Library does not generally acquire domestic technical reports in the computer sciences. By contrast, Stanford University has over 56,000 computer science technical reports in its collections, of which

only 30% are available digitally.