

citizen trust, cultural diversity, economic stratification, and educational attainment have long affected participation in democracy and access to government services. While there is no question that these obstacles persist in our era of e-government, the methodologically sound studies presented here offer social scientists a way to test how these challenges are mediated through different e-government initiatives as well as how to implement a variety of Internet discovery tools.

Librarians and students of information studies will also benefit from this book's careful analysis of end-user behavior in relation to Web sites, databases, and portal design. While the underlying goal of e-governments in democracies is to create systems that efficiently deliver needed information and services, different information structures, such as user-centered or agency-centered approaches, are shown to offer distinct advantages and disadvantages. Unlike commercial Web sites, democratic e-governments are quintessential public service institutions. As such, they can provide librarians with alternative models and (sometimes) innovative solutions to the problems of organizing a complex information environment for diverse end-users. Library Web designers undertaking Web usability studies will benefit from the performance metrics used to evaluate e-government portals.

*Comparative Perspectives on E-government* collects for its readers, in one volume, the thoughtful analysis of the discourse of information policy most important to researchers. It is a wonderful entrance into a developing political institution.—David Michalski, *University of California at Davis*.

**Buckland, Michael.** *Emanuel Goldberg and His Knowledge Machine: Information, Invention, and Political Forces*. Westport, Conn.: Libraries Unlimited (*New Directions in Information Management*), 2006. 380 p. (ISBN 0313313326). LC 2005-34357.

A invented it, while B and C got the credit, fame, and glory. Sound familiar? That, in a nutshell, is a major aspect of the story Michael Buckland recounts in his biography of Emanuel Goldberg (1881–1970), one of Germany's most creative engineering geniuses. Writing a biography of a man whose career the Nazis attempted to discredit is no small challenge: many of the documents essential to learning about Goldberg's life and work were destroyed in air raids during World War II or willfully obliterated by the Nazis. Many people who knew vital details did not survive the war, while some who did survive were unwilling to concede genius to this inspired inventor. In addition, air raids destroyed the working models of one key invention that is a prime focus of this biography.

Buckland, former dean of the University of California's School of Information Management Systems at the Berkeley campus, is now an emeritus professor. Because of his deep and broad knowledge of library and information science, he is uniquely qualified to research the life and achievements of Emanuel Goldberg, a remarkable but little known scientist. What makes his book especially noteworthy is that Buckland was able to assemble a fairly detailed portrait of Goldberg's life from very meager and widely scattered sources. Buckland's achievement is the result of long, arduous labor and intensive research. Further, his persistent detective work enabled him to go far beyond his subject's substantial scientific achievements. In his book, we see the human being behind the technological achievements and we perceive the inventor as a person, not simply as a mind.

Russian born, Emanuel Goldberg received his early education at a Moscow gymnasium. Following completion of his secondary studies, in which he excelled in science and technology, Goldberg wanted to enroll at the Imperial Technical School of Moscow. However, despite outstanding grades, he was denied acceptance because a quota system allocated only

three percent of admissions to Jews. Instead, he attended the University of Moscow, where he studied chemistry and then went on to further study in Germany, eventually settling in that country. He began his advanced studies at the Institute for Physical Chemistry at the University of Leipzig, continued in England at the School of Photoengraving and Lithography, and received his Ph.D. in 1906 from the University of Leipzig. That same year, Goldberg's creative career began in earnest when he took on his first important employment at the Technical University of Berlin, the city that was then the world's center of high technology R&D. In Berlin, Goldberg's field gradually shifted to concentration on photographic technology, including its chemical, optical, and mechanical aspects.

As his career matured, Goldberg developed a high level of expertise in precision mechanics, a field he was able to meld with his photochemical knowledge to produce innovative camera designs after World War I ended. He designed the Kinamo, a compact, highly successful movie camera, one of the first to be marketed expressly to amateurs. In commercial photography, Goldberg developed one of the first systems for making sound movies. He devised what became known as the "Goldberg Wedge," a sensitometric device for measuring light intensity and for calibrating photographic equipment and materials for optimum exposure. Goldberg was one of the earliest workers in aerial photography, but little specific documentation on his efforts survives. He was among a small cluster of German researchers who conducted some of the earliest practical experiments with television in the 1920s and 1930s. In the 1920s, he pioneered extreme reduction microforms, from which the well-known "microdots," a World War II German espionage tool, emerged. Early in the 1930s, Goldberg developed the Zeiss Contax 35mm camera, a very creditable competitor to the world-famous Leica and, in many ways, quite superior to the latter.

In the mid-1930s, he designed a compact, folding microfilm camera, perhaps the first true "scholar's camera."

Ultimately, Goldberg became the Managing Director—essentially the CEO—of Zeiss-Ikon, the most prestigious German optical firm of that era. But with Hitler's election as Chancellor of Germany in 1933, the Nazis took over both German politics and German industry. Party loyalists removed or "revised" company records to eliminate documentation of the Russian-born Jewish émigré engineer's connections to the Contax camera and to the Zeiss-Ikon firm. In the spring of 1933, after Goldberg had for some time been head of the Zeiss-Ikon works, Nazi goons actually arrested him and might have carried him off to a concentration camp. Luckily, Goldberg still had enough connections in high places to escape that fate. After being forced to sign a letter of resignation from Zeiss-Ikon, he narrowly escaped Germany, fleeing with his family first to Italy and France, and finally, in 1937, to Palestine. There Goldberg founded what was to become one of Israel's first technology companies devoted to the manufacture and repair of scientific instruments. He spent the remainder of his life in Israel.

But it is in the field of library and information science where Goldberg's mind and influence worked to make him a fitting subject of interest to the modern library community. Buckland's intensive research into surviving documents and his wide-ranging interviews with surviving family members and former Zeiss technical staff enabled him to uncover the significant details of Goldberg's major inventions in photography, optics, and precision mechanics.

To provide context, throughout the book Buckland keenly analyzes pivotal German political developments of the 1930s. He illustrates their grim impact upon the supposedly objective worlds of science and technology. He succinctly summarizes the character and worldwide influence of Germany's highly regarded

university system which, in pre-Nazi days, made German higher education so prestigious and valued. A valuable contribution to library history is Goldberg's clear and succinct outline of the Universal Bibliographic Repertory envisaged by contemporaries Wilhelm Ostwald and Paul Otlet, two great early 20th-century pioneers of documentation and information science. Buckland suggests that their ideas represent an early form of hypertext—or at least foreshadow its ultimate development. Several chapters deal in substantial scientific detail with photographic technology. But these chapters are not for beginners; their treatment is likely to be understood only by those who know the fundamentals of sensitometry.

In direct reflection of the "knowledge machine" referenced in the book's title, Buckland focuses powerfully on tracing the development of Goldberg's seminal contribution to modern information science, an apparatus for which others, notably Ralph Shaw and Vannevar Bush, got both the credit and the glory, and he explains why and how this happened. Ultimately, under the stewardship of American librarian Ralph Shaw (1907–72), Goldberg's concept was realized in the United States as Shaw's Rapid Selector and, still later, as a central concept of Vannevar Bush's fabled Memex.

What exactly was Goldberg's "knowledge machine" and why is so little known about it? Conceived in the late 1920s and early 1930s, the Goldberg device was an optical-mechanical apparatus that held microfilmed documents accompanied by previously assigned binary retrieval codes, the whole being stored on a long, rapidly scanned reel of microfilm. A photocell read retrieval codes and a target document was displayed on a screen or printed out. How would researchers find documents of interest? An encoded search argument input into the machine would cause the scan to halt when a document code and a search argument matched. (The system was similar to the "peek-a-boo" retrieval system implemented with

punched cards half a century ago.) Goldberg had developed his invention around 1930 and patented it in both Germany and the United States. In fact, IBM acquired the U.S. rights to Goldberg's patent, and Kodak Research Laboratories also knew of it. Unfortunately for Goldberg, in his patent he had called his device simply a "statistical machine," a name hardly suggestive of its intended usage. Equally unfortunate for Goldberg was the wartime loss of his working prototypes.

In the course of developing the Rapid Selector, Ralph Shaw, Librarian of the Department of Agriculture, had actually done a patent search but he never found the Goldberg patent. Quite understandable: neither he nor anyone else would have searched under the subject heading "statistical machine." Shaw's Rapid Selector was certainly a novel solution to a difficult problem, but three factors severely limited its scope and usefulness: (1) the device had a relatively limited storage capacity; (2) it was first necessary to microfilm all the documents of interest; and (3) the designer faced the seemingly intractable problem of analyzing and classifying every source document and assigning subject headings, index terms, or descriptors *before* microfilming. In practical terms, even in the 1940s, neither Goldberg's "statistical machine" nor Shaw's Rapid Selector could possibly have coped with the vast array of research materials of interest to scientists. Goldberg, and Shaw after him, certainly had an inkling of the right idea, but they lacked the technology to realize their concepts. Still, Goldberg surely deserves the credit for being the pioneer, though in the *ALA World Encyclopedia of Library and Information Science* (both the 1st and 2nd editions) it is Shaw who is given credit for "inventing" the device.

However, events outside the library community add to the story. It was an engineer, Vannevar Bush (1890–1974), who received most of the glory for the idea of a microfilm-based retrieval machine. During World War II, Bush was director

of the government's Office of Scientific Research and Development. In the 1930s he had already built a highly successful computer, the Differential Analyzer, an analog precursor of the modern digital computer. Later, Bush became a dean at MIT and, ultimately, president of the Carnegie Institution. At mid-century, with the exception of Einstein, probably no American scientist was better known or more influential. Bush, a very skillful writer and expert publicist, further enhanced his already secure reputation by publishing, in the July 1945 issue of the *Atlantic Monthly*, a highly influential and much-to-be-cited article, "As We May Think," in which he proposed the Memex, essentially a scientist's work station. The Memex would hold a vast store of information—compacted onto microform—in a desk. As Bush envisioned the device, scientists would work at consoles from whose screens they could call up any data in the so-called Memex for immediate display.

The *Atlantic Monthly* article instantly made Bush internationally famous far beyond the science community, raising him to an almost mythical status in the then arcane and not yet well-defined field of information science. A few experimental microfilm-based file and search machines were actually built at MIT and at ERA (Engineering Research Associates) for Ralph Shaw's Department of Agriculture Library. But the Memex itself remained nothing but a concept, a fantasy, because Bush, like many other would-be prophets of rapid information retrieval, had failed to understand that compact data storage wasn't the real challenge to a scientist's research work. The same three constraints that limited the usefulness of Shaw's Rapid Selector would surely have severely reduced the performance of the Memex, had it ever gone beyond the conceptual stage. The real problem, as every librarian knows, was identification, organization, and retrieval—"bibliographic control" in libraryspeak—a challenge not solved on a large scale until high-speed computers

and giant bibliographic networks began to be realized in the last third of the 20th century. Even now, finally catching up with librarianship, the major Internet services and software developers are at last discovering what we librarians have known for centuries: in a world awash in information, search-and-retrieval, not storage, is the truly central system need.

In the May 1992 issue of the *Journal of the American Society for Information Science (JASIS)*, Buckland wrote a succinct account of Goldberg's statistical machine that included a trenchant critique of the work done by Shaw and Bush to develop a high-speed microfilm-based document retrieval machine. In this article, Buckland conclusively established Goldberg's priority in the invention and creation of a working apparatus. Doubtless it was this article that started Buckland's quest for more information on Emanuel Goldberg, enough to portray the entire scope of this unheralded scientist's career. Through years of deep research and what must have been many frustrations and fruitless dead ends, Buckland has produced a book that not only greatly amplifies his *JASIS* article but also restores the reputation and achievement of a scientist that a perverted government attempted to discredit. To buttress his case, Buckland reprints selected original German language materials germane to Goldberg's life and work. There is a full bibliography of the scientist's publications, as well as many very good illustrations. A separate appendix contains over 250 numbered notes. (Actually, the extent of the notes is somewhat greater because note numbers are repeated when successive references point to the same source.) A general bibliography of over 500 entries, including both printed works and Web-accessible files, rounds out the work and provides stimulus for additional research. An appendix listing patents illustrates the wide span of Goldberg's scientific interests.

But alas, all is not well. Despite the richness of content and depth of his research, it is glaringly evident that the

author did not receive the editorial support he deserved. A host of embarrassing errors testify to the lack of editorial oversight and assistance. Editorial blunders and omissions—some serious—permeate the work. Here, there is space to cite only a few. The valuable and detailed numbered endnotes—some include original German wording—are nowhere referenced within the text itself! Without endnote numbers in the book, it is very laborious to connect a numbered note to its pertinent text. This is a great pity, because these notes often contain highly cogent comments that amplify the main text. At the end of the Preface, the author acknowledges sabbatical support from Phi Beta Mu, identified as the International Library and Information Science Honor Society. But Phi Beta Mu has nothing to do with library and information science: it is, in fact, the International Band Masters' Fraternity. (Was the typesetter unduly influenced by familiarity with Phi Beta Kappa?) However, the correct entity, Beta Phi Mu, is properly rendered in the acknowledgements on page 258. Some very strange typographical errors indicate that either someone in the production cycle was totally ignorant of how to properly divide German words or the hyphenation software could not handle German. On page 73 an incorrect word division—without even a hyphen—wrongly splits the long word *Feldluftschifferabteilung* into two parts, breaking the word in the middle of a syllable: *Feldluftschifferabt*

and *eling*. On page 121, another long word, *Arbeitsverteilungsvertrag*, is also improperly divided into two halves, *Arbeitsv* and *erteilungsvertrag*; again the division occurs in the middle of a syllable, an impossibility in German. In any case, the missplit is also missing its hyphen. On page 261, *Schreibmaschinenmanuskript* is inexplicably divided after its first two letters—another impossible split in German—and again there is no hyphen. On page 40 an entire line of text has been badly printed, all the words run together with no spaces between them; the same occurs on page 97.

The index, obviously the work of an unqualified amateur, is an abomination. Several entries are not in correct alphabetical sequence and some even contain misspellings (e.g., *Kalingrad* for *Kaliningrad*, cited within the entry *Koenigsberg*). There are no entries for some important personal names and none for certain concepts vital to understanding Goldberg's scientific work (e.g., *intellectual property rights*, even though this topic and other unindexed concepts are discussed at some length in the text). The Deutsches Museum in Munich is mentioned in the text as "the most important technology museum in the world at that time," but the world-famous institution does not merit an index entry in this technology-centered work. After Goldberg settled in Palestine, he researched the impact of sunlight on home construction materials and chose insulating and reflective components that would provide his family with "comfortable housing," as indicated in a subheading in the table of contents. Apparently, the "indexer" simply transferred that heading from the table of contents into the index despite the unsuitability of such a term. Who would look in the index for *comfortable housing* totally isolated from the entry for Goldberg himself? And what of *injured leg*, another isolated entry that would be a better sub-entry under Goldberg's own name? One index entry reads *Bosch (company)*, but there is another entry for the same entity

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under *Robert Bosch (company)*. But there is no cross reference and, except for one locator, both entries point to the same portions of the book. There is a single index entry for *DIN 4512*, a reference to film speed. But that entry does not relate DIN to the parent organization, the Deutsches Institut für Normung (in translation, the German Standards Institute). There is an index entry for the English name, but none for the German name. The numerous index deficiencies are somewhat of an irony, given that Libraries Unlimited has published several editions of a major work on indexing. (It may be gratuitous, however, to observe that this publisher's book on indexing contains many errors and was itself not well received by professional indexers who reviewed it.)

Michael Buckland, a distinguished, internationally renowned scholar has been ill-served by his publisher and by his editor, if indeed there was an editor. There is no acknowledgement of any editorial assistance and little evidence of any real care in preparing the book for the press. Editorially, there is a colossal qualitative difference between Buckland's meticulously done *JASIS* article and his book, and the difference substantially favors the former. Goldberg and Buckland deserve far better than they received from Libraries Unlimited and so do scholars, students, and other readers. It is a travesty of scholarship that this substantial work on library and information science, likely to be Professor Buckland's valedictory, and issued by one of the principal publishers in the field, should be filled with so many egregious errors, omissions, and other editorial faults. Can one hope that Libraries Unlimited will one day republish this wonderfully informative book with proper, competent editorial support? That is the least that Michael Buckland, Goldberg's career, and the entire community of scholars of library history and technology deserve.

Still, one should not permit these manifest editorial flaws to spoil Professor Buckland's enormous achievement

in bringing to light the career of a great scientist who, like many of his German and foreign colleagues, fell victim to the nationalistic madness that virtually destroyed German culture and science between 1933 and 1945. Emanuel Goldberg has at last received the understanding and recognition that his inventive genius deserved but were not possible in his lifetime.

Recommended for the libraries of schools of library and information science, for schools with graduate programs in photographic technology, and for all scholars and students of the history of library technology.—*Allen B. Veaner, Tucson, Arizona.*

**Cronin, Blaise.** *The Hand of Science: Academic Writing and Its Rewards.* Lanham, Md.: Scarecrow, 2005. 214 p. alk. paper, \$30 (ISBN 0810852829). LC 2004-24303.

Blaise Cronin is a well-known figure in librarianship, often described as an "outspoken library educator," and Dean of the School of LIS at Indiana. *The Hand of Science* covers topics such as disciplinary structures and genres of academic writing, exploring and parsing the nature and future of e-journal publishing, collaborative authorship, patterns and cultures of citation and acknowledgement, and academic reward systems in nine chapters. In themselves these topics would be of particular interest to academic librarians since they help situate library work and collections within a larger intellectual framework and describes something of our own intellectual environment. He weaves the topics together to give his perspective and outlook on academic writing and the loop of influence on LIS research and thinking. However, there are some problems with this volume that make it less than useful. I will briefly outline three of them.

First, the book is extremely repetitive. For instance, citations, citation analysis, and related subjects (like "references," bibliometrics, and acknowledgement