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Author

Buckland, Michael

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Four Forgotten Pioneers: Otlet, Ostwald, Briet and Goldberg

Michael Buckland

Abstract: A brief account of four pioneers who contributed to the tools, methods, and theory we take for granted today, yet all four remain relatively forgotten: Paul Otlet, Wilhelm Ostwald, Suzanne Briet and Emanuel Goldberg

Why recall forgotten pioneers? Human computer interaction is only one specific kind of mediating interface. If we want a broader understanding of interactions, we should be willing to think about other and earlier kinds of interfaces. Bibliographies are a kind mediating interface between a reader and literature; there are “soft” technologies such as categorization schemes and indexing systems that mediate in either digital and non-digital technologies; and people as intermediaries are, in a sense interfaces.

The following four pioneers—interested in interfaces, from this very broad definition—have been widely forgotten, until the recent revival of interest in the history of the organization of information.

Paul Otlet (1868-1944), along with Henri La Fontaine (1854-1943), was an idealistic Belgian lawyer. He was a pacifist, a feminist, and an internationalist. Otlet wanted to make the world a peaceful, prosperous place by democratizing information: He wanted to make all documents in all genres, formats, and languages available to everyone. Otlet had a vision of the Web long before digital computers were available; in 1895, he established an International Institute for Bibliography to make it happen.

A wealthy wife enabled Otlet to focus on this Institute, where he used the latest technology of his day: standard catalog cards bearing standardized descriptive metadata for each and every document. Published texts tend to be wordy, repetitive, and duplicative, so Otlet promoted a hypertextual approach whereby individual statements of fact (micro-documents known as “monographs”) were extracted from longer texts. A semantic “web” expressed the topic of each node, identified the documents relating to each topic, as well as the relationships between all topics and, thereby, all documents. For the semantic relationships he, La Fontaine, and others developed the Universal Decimal Classification—a more powerful version of Melvil Dewey’s Decimal Classification—that emphasized a faceted approach somewhat anticipating relational database design. the principal index had reached 11 million cards by 1914 and a commercial literature search service was established.

Otlet was very interested in new forms of the “book,” meaning new information and communication technologies that could enable us to escape the limitations of the printed codex. He and Robert Goldschmidt he invented microfiche in 1906 (about 72 microfilmed pages on rectangular sheets of film, a format widely used later in the twentieth century) and, later, a portable microfilm library. He had ideas about how telecommunications could be combined with workspaces and, already in 1925, foresaw that people would be reading texts in their own homes on television screens instead of visiting a library.

Otlet's increasingly visionary schemes were ultimately undermined by political changes, the Great Depression, the Second World War, and decreasing credibility. But as a pioneer, Otlet was ahead of his time: The Internet, in its present manifestation, bears a striking resemblance to his analog version.

Wilhelm Ostwald (1859 - 1932), a Nobel Laureate, is far from forgotten, but his work on information systems remains largely unknown. Born in Riga, Latvia (then Russia), he moved to Germany, became one of the founders of Physical Chemistry, receiving the Nobel Prize for Chemistry in 1909.

In 1910, visiting the World Fair in Brussels, he was inspired by Paul Otlet's International Institute for Bibliography. Ostwald used his Nobel Prize money to establish a similar institute, *Die Brücke* (The Bridge), in Munich. The name was significant. Agriculture, industry, and government were, then, geographically localized activities, but intellectual work was not. Thinkers and scholars were geographically dispersed and isolated, like an archipelago. We might now say that a network is needed, but Ostwald's image was of bridges connecting the islands to enable an intellectual community.

Ostwald collaborated with a Swiss businessman, Karl Bühler, to exploit the marketing gimmick of sets of sales cards ("monos"), with a picture on one side and an advertisement on the other. By 1912 Ostwald and his Bridge colleagues were claiming that if all known facts were concisely stated—each on a card and updated as necessary—then a set of cards would be a dynamic, updated representation of all current knowledge, a "world brain," as later popularized by H. G. Wells. Better yet, Ostwald the chemist believed that a systematic combinatorial approach was necessarily more reliable than fallible human inventiveness in determining optimal solutions. He noted that just as Gutenberg's invention of moveable type an individual piece of type to be continuously recycled into new combinations to form new words—the letter "g" in Grudin today, in "leg" next week, and in "gin" the following week—so the systematic manipulation of concepts ought to generate new knowledge.

Ostwald was a man of prodigious energy and broad interests, including a concern for the organization of science and the structure of scientific literature. A bibliography is a mediating structure empowering the searcher home in on writings of any desired form and topic. Ostwald's book *The Chemical literature and the organization of science* (1919) is widely considered the first specialized guide to a subject literature.

Ostwald's influence reaches us today through the ISO international paper sizes (A4, etc.), based on the German DIN 476, a lightly adapted version of the Ostwald's "World Format." In addition, the RGB color system on computer screens is based on Ostwald's color studies.

Emanuel Goldberg (1881-1970) was born in Moscow in 1881 and moved to Germany to escape Russian anti-semitism. He engaged in research and innovation using various media and technology, such as photography, printing, cinematography, photoengraving, and television. He completed his PhD at Ostwald's Institute in Leipzig where he was also influenced by Wilhelm Wundt's work on the physiology and psychology of perception. Goldberg was a skilled craftsman and liked to describe himself as "a chemist by learning, a physicist by calling, and a mechanic by birth." This combination made him very interested in labor-saving equipment and ergonomic design, which is reflected in cameras designed by him or under his direction when he founded Zeiss Ikon in 1926. At the time it was a leading high-tech company and the world's

largest camera firm. The famous Contax 35mm camera, designed by him to compete with the Leica, had several ergonomic innovations. It was, for example, the first camera to have the range-finder aperture within the viewfinder.

Goldberg has had a curious, hidden influence on computing. He decided to see the extent to which microfilm could be physically compressed. In 1925 he presented microdots at a resolution equal to the entire Bible 50 times over on one square inch of film, yet legible under a microscope. His design, using a microscope backwards as a camera, allowed the photographer to watch the image form. The photographer, then, would know when the exposure was complete. But if you could store 800,000 pages on a 3x5 1/2 inch sheet, how would you ever find out which ones addressed a topic you were interested in?

In 1927 Goldberg submitted the first several patents for an electronic search engine. Images of documents were stored on 35mm microfilm, and descriptive indexing was encoded next to each page. The search query was expressed as a pattern of thin light beams shone on to the microfilm as it was passed through a movie gate. Pattern recognition, using a photoelectric cell, sensed when the thin light beams of the query coincided exactly with the index codes on the film. A match was a “hit” and the document was projected to a screen or a hard copy was produced. The query could be entered in the form of a punched card or dialed in using a rotary dial telephone handset. Dialing a query allowed remote usage of network-accessible search engines.

The search engine, which Goldberg called a Statistical Machine, was widely demonstrated and patented in 1931. Descriptions in English and German were published in 1932. Goldberg used this device to keep track of his business correspondence until he was kidnaped by Nazi thugs in 1933 and became a refugee.

Starting in 1938 an American engineer tried to build an faster version without a movie gate, calling it a Microfilm Rapid Selector. It didn’t work very well, but in 1945 he published an essay speculating on what might be done with a desktop microfilm reader with a search engine. The essay was: “As we may think,” and the author was Vannevar Bush. That it was based on technology developed and patented by Emanuel Goldberg nearly two decades earlier was never acknowledged. Experts knew that the ideas presented by Bush were not new, but they were new for most readers, and Bush—not Goldberg—has been cited incessantly ever since.

Goldberg was unlucky in that regard. Non-fiction works on espionage still attribute Goldberg’s microdot technique to an imaginary Professor Zapp on the authority of a misleading article by J. Edgar Hoover in the April 1946 *Readers Digest*. His successor at Zeiss Ikon took credit for the Contax and Goldberg, the founding CEO was excluded from successive Zeiss corporate histories as late as 2000.

Suzanne Briet (1894-1989) was one of a group of activists who transformed library services in France between the two World Wars. She was interested in the role of librarians and bibliographical services as an interface mediating between the individuals and available literature. Briet was one of the first women librarians appointed to the French National Library at a time when bibliographies and reference works were shelved along with everything else in inaccessible closed stacks. She was given the assignment of establishing a reference room, opened in 1934 and contained a catalog and the most useful reference works and bibliographies. She organized supplementary indexing and developed a bibliographic advisory service, with a staff trained to assist researchers.

Designing cost-effective systems for discovery was then called “Documentation” and specialized, proactive librarians were called “Documentalists.” Briet was very active in professional associations and in attempts to develop professional education for documentalists. As the first Director of Studies in 1951 of the National Institute for Techniques for Documentation (still flourishing in Paris), she has some claim to have been the first “i-School” dean.

Briet was, in a way, Otlet’s successor as theorist of documentation. In 1951 Briet published a remarkable manifesto called *Qu’est-ce que la documentation?*, only recently available in an English translation as *What is documentation?* with a commentary by Ron Day and a brief biography. Briet adopts a semiotic view, defining documents as indexical signs exposing an unlimited horizon of networks of techniques, technologies, individuals, and institutions. Documents are increasingly substitutes for lived experience; documentation is a cultural necessity of modernity.

Briet’s manifesto received little attention and, probably discouraged by resistance to innovation, she retired early in 1954 and turned her attention to scholarly studies of the history of northern France and the poetry of Arthur Rimbaud. She died in 1989, largely forgotten until a recent renewal of interest in her manifesto.

Briet had a poetic description of an interactive interface. The dynamic, mediating role of a documentalist involved both guidance from the person being helped and specialized abilities in locating what that person wanted. So the documentalist should be “*comme un chien du chasseur – guidé et guidant*” – like a hunter’s dog—guided and guiding.

Summary

All four of the individuals spotlighted in this article contributed to the tools, methods, and theory we take for granted today, yet all four remain relatively forgotten. Please, take a minute to recall these pioneers

Further reading:

Paul Otlet:

Alex Wright. *The Web Time Forgot*. <http://www.nytimes.com/2008/06/17/science/17mund.html>
Alle Kennis van de Wereld (Biography of Paul Otlet). Documentary film, 1998.

<http://www.archive.org/details/paulotlet>

Rayward's Otlet Page: Paul Otlet and Documentation.

<http://people.lis.illinois.edu/~wrayward/otlet/otletpage.htm>

P. Otlet. *International organisation and dissemination of knowledge: Selected essays*. Elsevier, 1990. <http://www.archive.org/details/internationalorg00otle>

Wilhelm Ostwald

See the website of Thomas Hapke, esp. <http://www.tu-harburg.de/b/hapke/ostwald/ostwald.htm>

Emanuel Goldberg

Emanuel Goldberg. http://en.wikipedia.org/wiki/Emanuel_Goldberg

M. Buckland. *Emanuel Goldberg and his Knowledge Machine*. Libraries Unlimited, 2006.

Suzanne Briet

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Suzanne Briet. *What is Documentation?* Scarecrow Pr., 2006. ISBN 0-8108-5109-1. Translation of *Qu'est-ce que la documentation* (EDIT, Paris, 1951).

See Ron Day's Briet webpage at <http://ella.slis.indiana.edu/~roday/briet.htm> for a brief biography, annotated translation, commentary on documentation as "cultural technique", and a selective list of Briet's writings.