The Secret History of Hypertext

By Alex Wright

When Vannevar Bush's "As We May Think" first appeared in *The Atlantic*'s pages in July 1945, it set off an intellectual chain reaction that resulted, more than four decades later, in the creation of the World Wide Web.

In that landmark essay, Bush described a hypothetical machine called the Memex: a hypertext-like device capable of allowing its users to comb through a large set of documents stored on microfilm, connected via a network of "links" and "associative trails" that anticipated the hyperlinked structure of today's Web.

Historians of technology often cite Bush's essay as the conceptual forerunner of the Web. And hypertext pioneers like Douglas Engelbart, Ted Nelson, and Tim Berners-Lee have all acknowledged their debt to Bush's vision. But for all his lasting influence, Bush was not the first person to imagine something like the Web.

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In the years leading up to World War II, a number of European thinkers were exploring markedly similar ideas about information storage and retrieval, and even imagining the possibility of a global network—a feature notably absent from the Memex. Yet their contributions have remained largely overlooked in the conventional, Anglo-American history of computing.

Chief among them was Paul Otlet, a Belgian bibliographer and entrepreneur who, in 1934, laid out a plan for a global network of "electric telescopes" that would allow anyone in the world to access to a vast library of books, articles, photographs, audio recordings, and films.

Like Bush, Otlet explored the possibilities of storing data on microfilm and making it searchable, with a web of documents connected via a sophisticated linking system. Otlet also wrote about wireless networks, speech recognition, and social network-like features that would allow individuals to "participate, applaud, give ovations, sing in the chorus." He even described a mechanism for transmitting taste and smell.

That vision evolved over the course of nearly half a century of experimentation. In 1895, Otlet and his partner Henri La Fontaine—a Belgian senator and future Nobel Peace Prize Winner—launched a project called the Universal Bibliography, or *Répertoire Bibliographique Universel*, an ambitious plan to catalog of all the world's published information.

After winning the support of the Belgian government, the two men hired a staff of catalogers who eventually created more than 15 million entries stored on index cards (the state-of-the-art storage technology of the time), all classified using a system called the Universal Decimal Classification, an

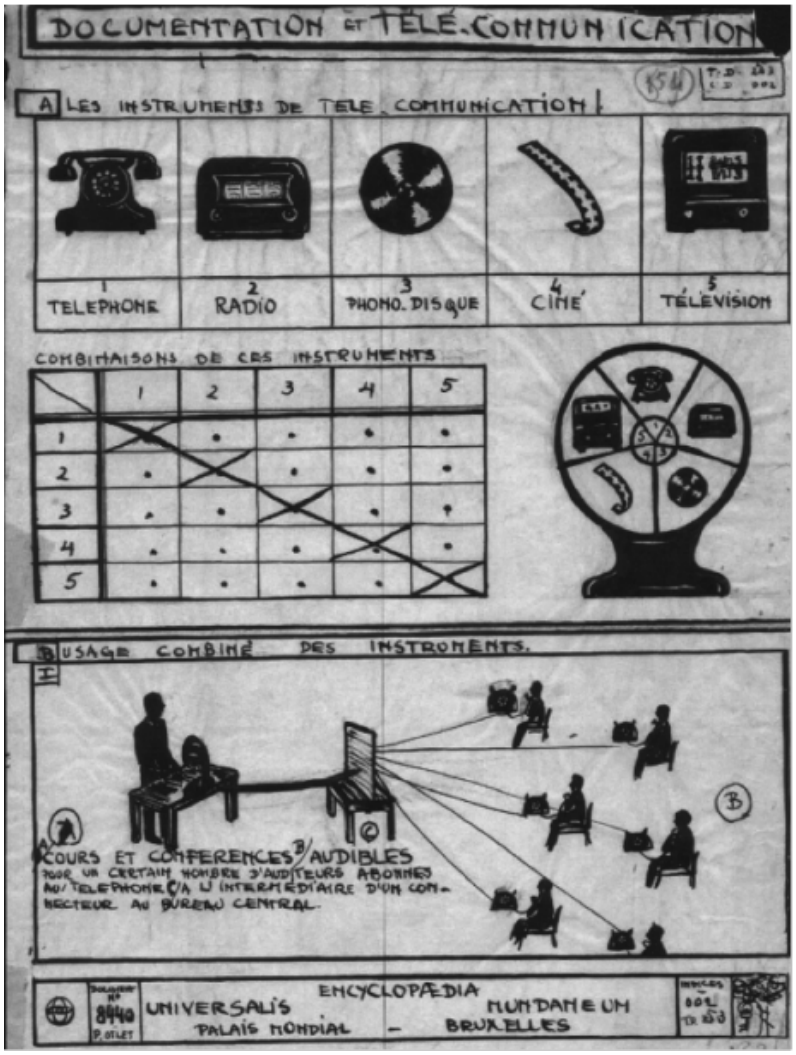
adapted version of the Dewey Decimal System. At one point, they even ran a commercial service that would allow anyone to submit a query and receive an answer via telegraph, for a small fee.

Over the decades that followed, Otlet continued to pursue his quest to organize the world's information, working with a far-flung cast of collaborators that included Swiss architect Le Corbusier, Austrian philosopher Otto Neurath, Scottish sociologist Patrick Geddes, and eccentric Norwegian-American sculptor Hendrik Andersen. Together they launched a series of interconnected ventures, including an international network of associations, a global newspaper archive, and a sprawling 150-room museum called the Palais Mondial with exhibits on topics ranging from aeronautics to paleontology to the history of Spain. Along with La Fontaine, Otlet even played a role in the formation of the League of Nations, pitching a grandiose, ultimately failed plan for a World City that would serve as the headquarters of a new world government, with the Universal Bibliography and Palais Mondial as its intellectual nerve center.

By the 1930s, Otlet started to imagine all these endeavors converging into a global knowledge network that he dubbed the Mundaneum. In his 1935 book *Monde*, Otlet elaborated further on his vision of a utopian network:

> Everything in the universe, and everything of man, would be registered at a distance as it was produced. In this way a moving image of the world will be established, a true mirror of his memory. From a distance, everyone will be able to read text, enlarged and limited to the desired subject, projected on an individual screen. In this way, everyone from his armchair will be able to contemplate the whole of creation, in whole or in certain parts.

Here's a partial illustration



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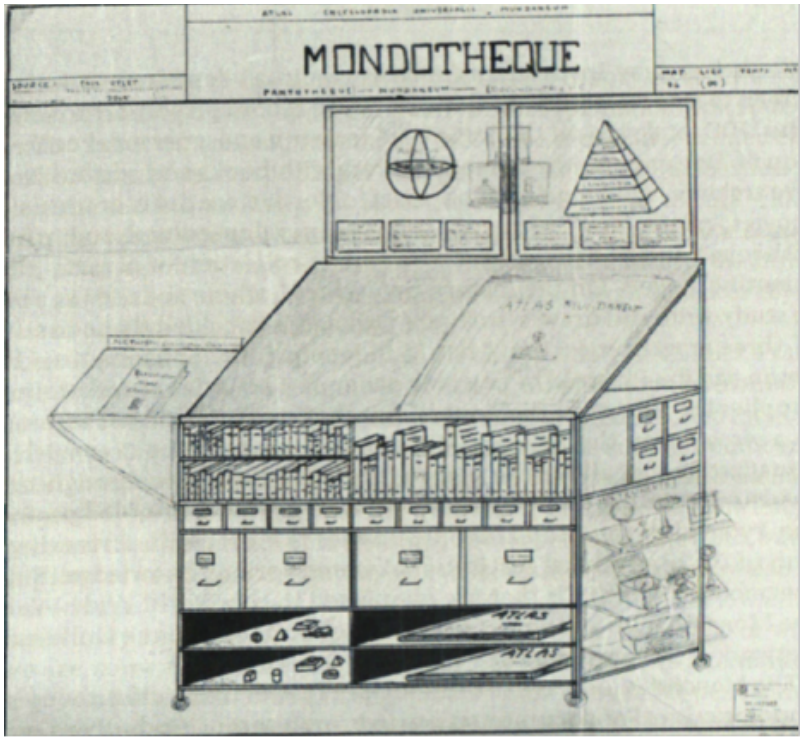
And here's a 1941 drawing of Paul Otlet's Mondotheque:



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For all of Otlet's remarkable prescience, he was scarcely alone in exploring new ways of organizing and distributing the world's information. In 1883, the French novelist Albert Robida described a fictional machine called the *téléphonoscope*, capable of projecting words and images across great distances. In his novel, *The Twentieth Century*, characters used this contraption to get their news and entertainment, and shopped for merchandise from the comfort of their homes. Seventeen years later, Robida helped plan the Paris World's Fair of 1900, where many attendees caught their first glimpse of moving pictures, escalators, Campbell's Soup cans, and Otlet's Universal Bibliography.

In 1927, a Russian-born Jew named Emanuel Goldberg patented a device called the Statistical Machine, which allowed a user to search and retrieve large volumes of data stored on microfilm by using a so-called search card. He later introduced a technique that would allow a user to enter a query via telephone: the first dial-up search engine. When Bush later tried to patent his own microfilm-indexing tool called the Rapid Selector—a precursor to the Memex—the U.S. patent office turned him down, citing Goldberg's work.

Goldberg's promising foray into microfilm indexing came to an abrupt halt in 1933, when members of a Nazi-controlled Workers' Council stormed into his office at the Zeiss Ikon camera company, and marched him at gunpoint out in the rain to a local bar, where he was forced to stand at attention in front of a Swastika for several hours. The next day, they forced him to write his resignation letter and exonerate his kidnappers. Shaken, Goldberg fled with his family for Paris. In 1937, he left for Palestine. He never again resumed work on the Statistical Machine.

Before leaving Paris, Goldberg attended a conference organized by Otlet on the future of documentation. There, the two men joined a number of other prominent librarians, scientists and publishers, all of whom were interested in exploring the potential of new technologies to tame the growing onslaught of recorded information. At the 1937 conference, Otlet and Goldberg had the chance to meet another important intellectual ally: the novelist H.G. Wells. Best known today for his science

fiction novels like *War of the Worlds* and *The Time Machine*, Wells was also a prolific essayist and committed socialist who believed passionately that new information technologies would one day usher in an era of social equality and world peace.

With war clouds gathering, Wells urged the crowd to focus their attention on the potential of networked information to bring about a transformation of the human condition. "The world has to pull its mind together," he said, "This synthesis of knowledge upon which you are working is the necessary beginning of a new world." The next year, Wells published a collection of essays on this theme under the title *World Brain*. "The whole human memory can be, and probably in a short time will be, made accessible to every individual," he wrote. "It can have at once the concentration of a craniate animal and the diffused vitality of an amoeba."

He imagined the eventual emergence of a "super-human memory" fanning out across the globe in a "world-wide network" that would foster cooperation among the world's universities, research institutions, and other centers of intellectual life. The optimism of the 1937 conference proved short-lived. In 1940 the Nazis invaded Belgium. A Nazi delegation interrogated Otlet about his "foreign contacts." Soon enough, Nazi troops stormed the Palais Mondial, destroying much of the collection to make room for an exhibition of Third Reich art.

Otlet died in 1944, soon to be a forgotten man.

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There is, alas, no known paper trail connecting Bush with Otlet, Goldberg, Wells—or much of anyone else, for that matter. As the scholar Michael Buckland has pointed out, Bush was notoriously stingy with citing others' work. "As We May Think" contains no footnotes (though, in fairness, nor do most articles in *The Atlantic*, including this one).

At first glance, the Memex appears not far removed from Otlet's Mondotheque—and the two were conceived of at nearly the same time. (Bush first wrote most of "As We May Think" in 1939, but shelved his draft until after the war.) Both machines relied on microfilm for storing documents, and both provided a mechanism for collecting, annotating, and sharing documents. They also both featured rudimentary speech-recognition tools. But the two machines also differed from each other in several critical respects.

Otlet envisioned the Mundaneum as a tightly controlled environment, with a group of expert "bibliologists" working to catalog every piece of data by applying the exacting rules of the Universal Decimal Classification. Wells proposed something similar, with a special class of technical "samurai" administering the contents of the global brain. Bush, by contrast, envisioned a flat system with no classification scheme. Indeed, the Web's openness and lack of hierarchy—for better and worse—has strong conceptual roots in Bush's bottom-up document structure. Otlet also envisioned a multimedia system capable of handling film, photographs and audio material, whereas Bush was primarily concerned with written and numerical data. Finally, Otlet saw the network as essential to his vision of a worldwide platform for knowledge sharing; Bush envisioned the Memex as a stand-alone machine. For all his remarkable prescience, Bush never predicted anything like the Internet. That credit rightly goes to Otlet.

Alternative history is a fool's game. The Web is what it is, and Bush undoubtedly deserves his place as one of its avatars. But we might do well to remember that history rarely runs in a straight line; it is

littered with false starts and dead ends. Sometimes the best path forward lies in taking a few steps back, or sideways. By exploring some of these abandoned paths, perhaps we will yet discover that the Web is not quite such a fait accompli as we may think.