

“As We May Think” by Vannevar Bush (1945)

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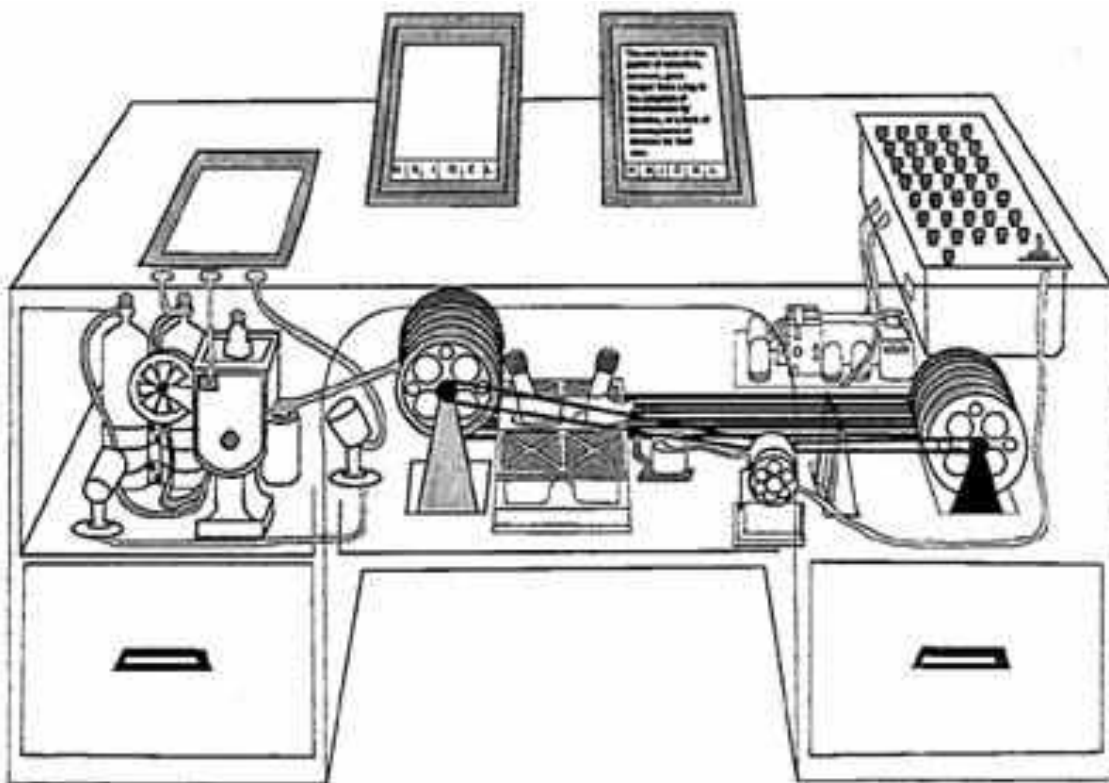
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“Consider a future device for individual use, which is a sort of mechanized private file and library.” It would store all the books and music you owned as well as every communication you every received. This technological marvel sounds like the subject of a modern day TED Talk or former Apple CEO Steve Jobs describing the iPhone. But these promises or greater computing or an ocean of information at our fingertips were not made in this century. This prediction was the thought of American engineer, Dr. Vannevar Bush, and it was made over seventy years ago, in the closing days of World War II. In his 1945 essay, “As We May Think,” Bush sketched out the earliest contours of the “information society.” He foresaw the rise of “big data” and its potential to reshape economies, educational systems, and what it meant to be human in an increasingly technological age. Bush worried that the summation of the human experience was expanding at too rapid a rate and humanity’s means of making sense of these experiences was obsolete, a relic of a different and simpler time. Humankind needed new technologies to collect, store, and retrieve this coming flood of knowledge. Bush believed that he had the answer.



Bush's essay first appeared in the July 1945 issue of *The Atlantic* magazine. Readers were introduced to Bush as not just a leading U.S. scientist, but also as the federal government's Director of the Office of Scientific Research and Development (OSRD). The same month Bush's essay appeared in the pages of *The Atlantic*, OSRD successfully tested their famous creation, the atomic bomb. Bush suspected that the bombs' use the following month, on the Japanese cities of Hiroshima and Nagasaki, would probably end the war. In the essay's opening section, Bush remarked that the war forced scientists to "bury their old professional competition" and find common cause. But Bush's essay wondered about what scientists would do next, what would come after the war's end? Bush believed that in peacetime, scientists needed to find the next set of objectives that would bring out the best of them and the larger scientific community.

In the first half of the essay (it is composed of eight sections), Bush laid out how science had improved humankind's existence. Science gave us greater freedom from disease, and increased our life spans. Individuals could communicate with one another faster than at any point in history. What seemed to animate Bush the most however was how humankind could condense great volumes of information into readily accessible formats. Bush theorized that in the near future, whole encyclopedias could be reduced to the size of a matchbook or that a million books could occupy one side of a desk. In Bush's estimation, all human knowledge could fit in a space no larger than a moving van. Yet for all of Bush's musings about easier access to all human knowledge, he feared there was not tool that could sort and sift through endless streams of data. What good were a million books if a researcher could never find the one work they were looking for? Who did it help to have all this information, but no way to make sense of it?



What Bush proposed was the "Memex," a device that stored and processed large amounts of data. By analyzing scores of data quickly, the "Memex" was a hardware prototype for a search engine or hypertext because it could associate and connect multiple, even arbitrary ideas together. The "Memex" was unlike other indexing systems because instead of categorizing information chronologically or alphabetically, it functioned more like the human mind and made associations between pieces of information. What Bush envisioned were the earliest examples of machine learning and how computers could evolve into more nuanced thinkers. With its power to store and search

vast amounts of data, Bush saw the “Memex” as a means to supplement one’s memory. Instead of remembering dates and numbers, the human mind could be free to ponder existence’s great mysteries, the “Memex” would handle everything else.

Bush’s 1945 essay, “As We May Think,” is a rich primary source for a course on the history of technology or a section of a history survey discussing postwar life and transitioning from war to peacetime.⁷⁸ My students read Bush for a course on the history of digital culture. The essay appeared alongside works of fiction, like Jonathan Swift’s *Gulliver’s Travels* and Jorge Luis Borges’s “The Garden of the Forking Path” to examine how earlier thinkers conceived of ideas we not take for granted: mainframes, hypertext, big data. Students are surprised to read about a scientist, over seventy years ago, envisioning endless encyclopedias (i.e. Wikipedia) or a device capable of containing all of their communications (the phone in their pocket). I encourage students to think about what Bush was describing, which modern day devices does it sound like he is discussing, and where Bush’s ideas did not match up to the future. Bush could not imagine software handling so much memory or how much smaller data ultimately could become with the right device. A primary source like Bush’s essay is great in the classroom because students see technological breakthroughs as a process, not a one-time event. It demonstrates a longer history of ideas such as hypertext or search engines. Such creations, in earlier designs, were around way before Google. Finally, the source reminds readers that even prophetic thinkers like Bush can get details wrong or underestimate the technology they herald. Bush was one of the greatest scientific minds of his era and even he could not process how computers would evolve, reshape our world, and usher in a new digital age.

⁷⁸ For further information about Vannevar Bush, U.S. scientists like him, and American science at the end of World War II and beginning of the Cold War, consult Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York: Columbia University Press, 1994); Chandra Mukerji, *A Fragile Power: Scientists and the State* (Princeton: Princeton University Press, 2016); Jessica Wang, *American Science in an Age of Anxiety: Scientists, Anticommunism and the Cold War* (Chapel Hill: University of North Carolina Press, 1999); Zuoyue Wang’s *In Sputnik’s Shadow: The President’s Science Advisory Committee and Cold War America* (New Brunswick: Rutgers University Press, 2008); Spencer R. Weart, *Scientists in Power* (Cambridge: Harvard University Press, 1979); Hunter A. Dupree’s *Science in the Federal Government: A History of Policies and Activities to 1940* (Baltimore: Johns Hopkins University Press, 1986); and Vannevar Bush’s report, “Science the Endless Frontier.”