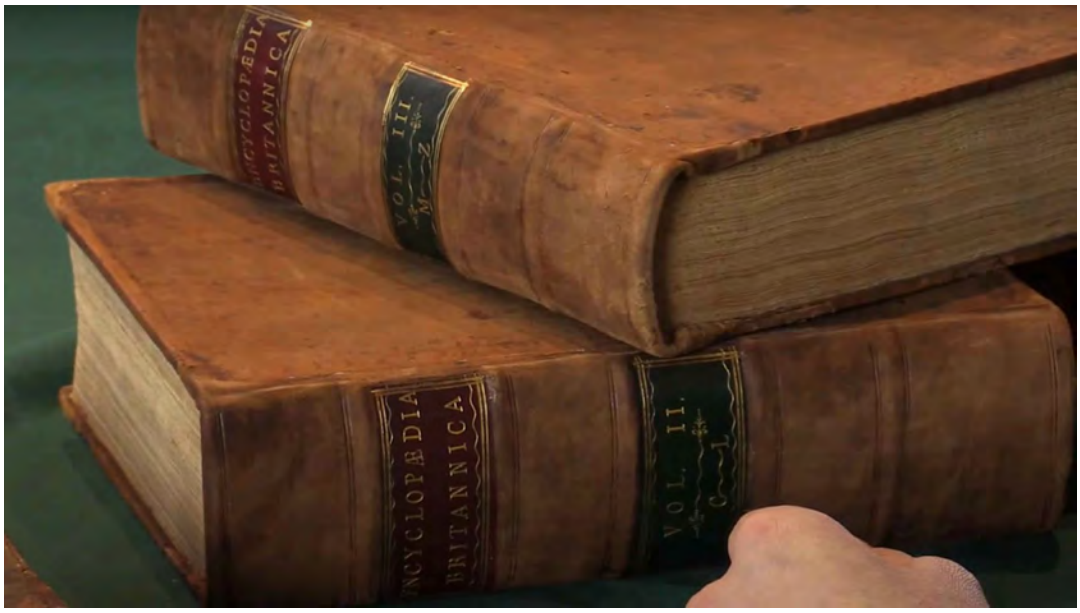
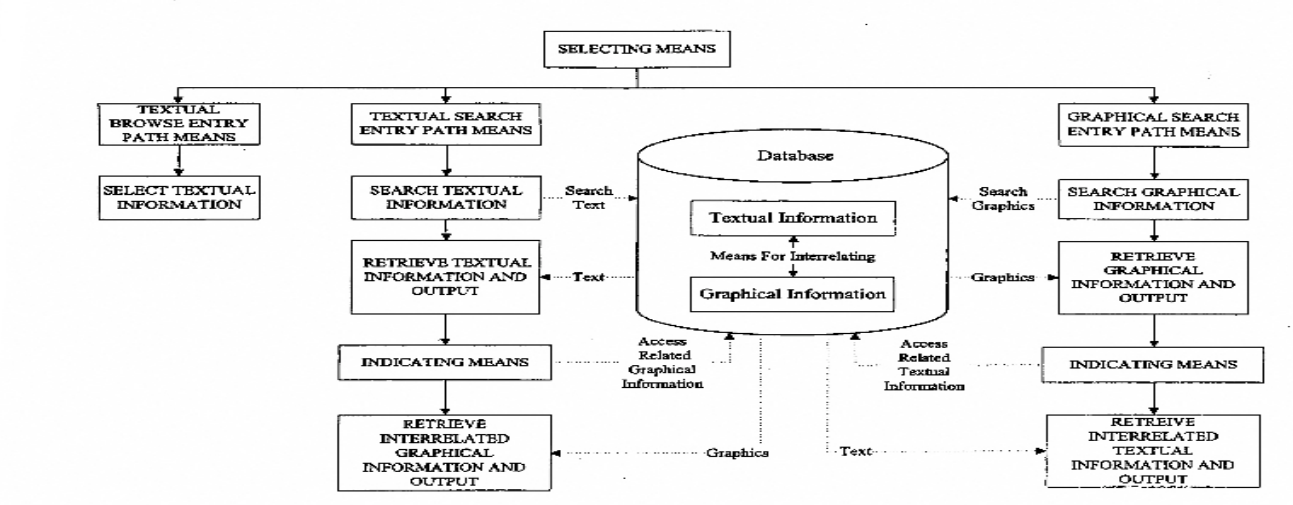
Inventing the Future - Encyclopaedia Britannica



First Edition, Encyclopaedia Britannica 1768

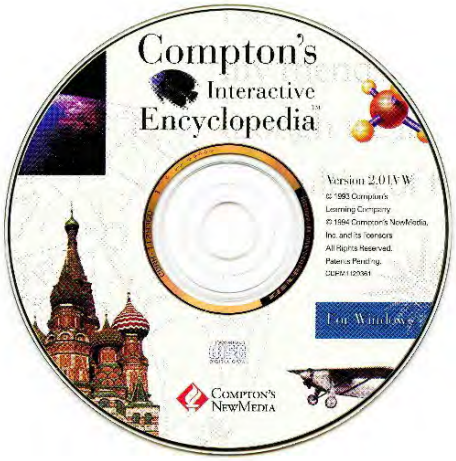
Only an Artifact of the Scottish Enlightenment?

Who would have guessed that at the end of the 20th Century it would be a company founded in Scotland in 1768 that would invent a key part of the mechanics that would let people intuitively navigate the electronic flood of text, sound and images soon to drench the planet from the internet?



CLAIM 1 OF THE '671 PATENT

In 1989, 221 years after the company's founding in Edinburgh during the Scottish Enlightenment, Chicago-based Encyclopaedia Britannica, Inc., publisher of its eponymous *Encyclopædia Britannica* reference work, had not only solved this puzzle for the first time, but it was also issued a patent for it. While it may be incongruous that a legacy reference print publisher would be the party to make the discovery, this is exactly what happened



Normal patents on inventions today have a revenue producing life of 20 years. The patents Britannica filed for in 1989 were issued by the U.S. Patent and Trademark Office in 1993. Immediately controversial, software industry opposition caused the Commissioner of Patents to promptly order a reexamination by the Patent Office. Following the Commissioner's invitation, the Office cancelled the patent a year after it had issued. After more years of litigation by Britannica, another court finally reversed the Patent Office and in 2002, the patent was reissued. Then it was finally up to Britannica to enforce the patent against infringers. The family of Compton's Patents were unusual both in their long and controversial history, but also in that they never earned a nickel. Indeed, in 2015, after years of lawsuits in multiple court venues, they were finally found to have been improperly issued by the U.S. Court of Appeals for the Federal Circuit. In 2011 the court found that there had been a technical and procedural error in the original filing papers.

The technical defects meant that a court never got to a detailed ruling on whether then commonplace GPS navigation systems infringed the patents covering Britannica's invention. When Britannica later sued its outside patent law firm for legal malpractice for committing the technical error, another court denied this claim saying that, if the patent shouldn't have been issued by the Patent Office in the first place, Britannica couldn't have been hurt by the law firm's mistake.

Even though Encyclopaedia Britannica never benefited financially from the extraordinary human/machine interface it had been the first to build, it had reason to be proud of its fundamental achievement. The public filing of its patent application had provided the roadmap for others to follow in quickly developing many other complex software applications besides encyclopedias. The Britannica human/machine interface provided for the first time seamless navigational paths into and through complex databases of mixed media including, text, graphics, maps, videos and audio elements. When

developed, the goal had been to have even a nine-year old master the navigation. Of course today some four-year-old children are playing with computers in a way unthinkable in 1989 when the Compton's Patent application was filed.

Britannica's landmark invention had partly to do with the evolution of the personal computer in the mid-1980s. But it also had to do with a small group of encyclopedists who had been struggling for many years before to define what an electronic encyclopedia would look like. The culmination of their work happened to coincide with the coming of age of the personal computer in the nascent consumer market. This was the secret sauce that made the breakthrough in the human/machine interface possible.

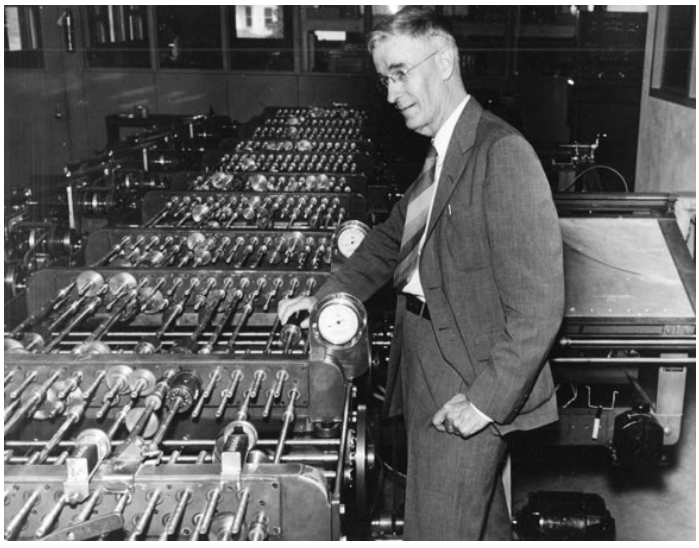
This fortuitous combination produced a remarkable cultural result. It meant that for the first time, children, as well as adults, could easily and quickly access and navigate complex and media-rich stores of digital information. It also created a plumbing roadmap for the software design that in later years would prove essential in making user friendly such diverse applications as automobile GPS navigation systems and websites on the internet.

Four pioneers in the development of computer interfaces stand out: Vannevar Bush, Ted Nelson, Douglas Engelbart, and Alan Kay. Each made exceptional contributions to the developing field of how humans interact with machines and each helped set the stage for Encyclopaedia Britannica's unique invention in the 1980s. Two of the four, Bush and Kay, even directly applied their thinking specifically to the problem of building an electronic encyclopedia,

Vannevar Bush

Vannevar Bush with President Harry Truman

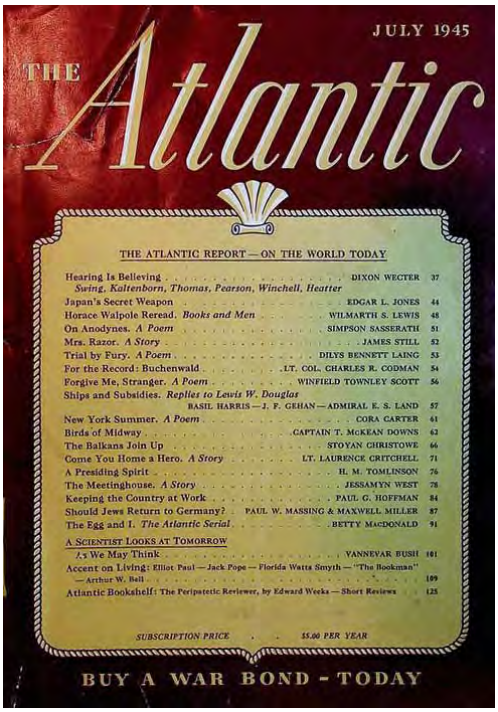
The scientist with the most penetrating early vision of the machine's potential role in helping us easily access the growing storehouse of human knowledge was Vannevar Bush. After he received a joint doctorate in electrical engineering from the Massachusetts Institute of Technology and Harvard in 1916, Bush showed a bent for military applications by inventing a submarine detection device during World War I. Then in the 1920s at MIT, he began to design and build analog computers. These early machines used voltage variances to reflect different numeric values. These machines were the precursors to today's binary language, digital computers that use zeros and ones to represent data. In 1928, Bush was issued a pioneering patent for one of his computers and by 1935 his Rockefeller Differential Analyzer was the most powerful computer of its day. It was quickly put to the task of solving problems associated with the development of long- distance power lines. Then, in World War II, it was turned to the task of producing artillery ballistics tables to assist the military.



At the beginning of World War II, Bush made recommendations to President Franklin Roosevelt about how to organize scientific research to keep the military abreast of new technologies. Then, during the war, Bush headed the federal government's Office of Scientific Research and Development. It has been said that radar (from the acronym for "radio detection and ranging") won the war, and the atomic bomb ended it. Bush and his Office had played a crucial role in both developments.

Towards the end of the war, Bush gave considerable thought to the potential application of computers to peacetime requirements and their likely evolution in the post- war era. He came to believe computers could play an important peacetime role in managing the increasing store of humanity's accumulated knowledge.

The Atlantic Monthly's As We May Think Article 1945



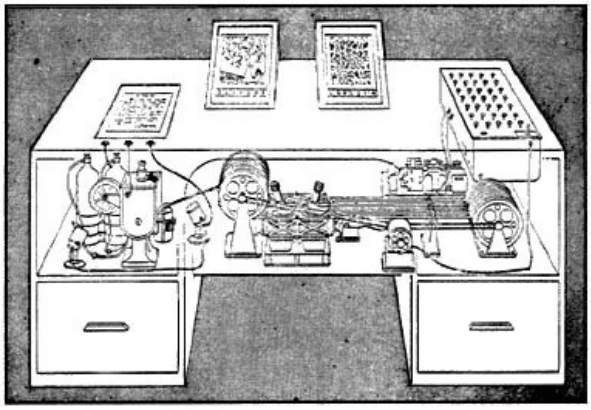
In a now landmark article for the *Atlantic Monthly* published in July 1945, entitled "As We May Think," Bush laid out a vision of a world in which computers would be central to our social and business life. The article remains to this day, stunning in the accuracy of its perceptions regarding the likely evolution of computing. In an introduction describing the thrust of Bush's article, the *Atlantic Monthly*'s Editor wrote, "Now, says Doctor Bush, instruments are at hand which, if properly developed, will give men access to and command over the inherited knowledge of the ages." No small step for Mankind that.

In the article, Bush looked at recent advances, such as the cathode ray tube, dry photography and microphotography and pondered how logical extensions of these technologies might be applied to create a future miniaturized Encyclopædia Britannica:

The Encyclopædia Britannica could be reduced to the volume of a matchbox. A library of a million volumes could be compressed into one end of a desk. If the human race has produced since the invention of movable type a total record, in the form of magazines, newspapers, books, tracts, advertising blurbs, correspondence having a volume corresponding to a billion books, the whole affair, assembled and compressed, could be lugged off in a moving van.

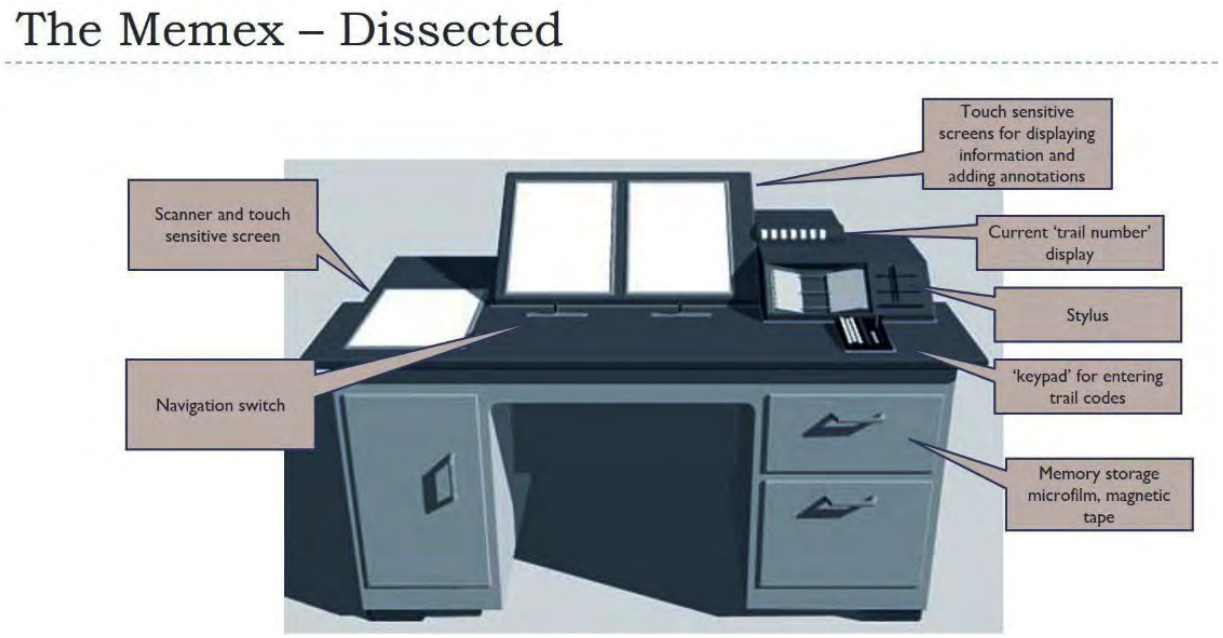
Although Bush thought in terms of microfilm rather than magnetic drives, optical discs or silicon wafers for data storage, he conjured up a likely playback machine for a high-capacity storage medium that closely resembles the personal computer of today.

Bush called it a Memex and described it this way:



Memex in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference (*LIFE* 19(11), p. 123).

> Consider a future device for individual use, which is a sort of mechanized private file and library. It needs a name, and, to coin one at random, 'memex', will do. A memex is a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory. … On the top are slanting translucent screens, on which material can be projected for convenient reading. There is a keyboard and sets of buttons and levers. Otherwise, it looks like an ordinary desk. In one end is the stored material . . . Wholly new forms of
>
> encyclopedias will appear ready made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified.



Bush did a prescient job describing in 1945 his idea of what a personal computer of the future might look like. This is particularly true given the required reliance on vacuum tubes for the computers in that era. Vacuum tubes were a great limitation for the computers of the time.

Though the transistor was invented in 1947 by physicists at Bell Telephone Laboratories, the shift from slow, heat producing vacuum tubes that often burned out, to cooler, more powerful and reliable transistors did not unfold overnight.

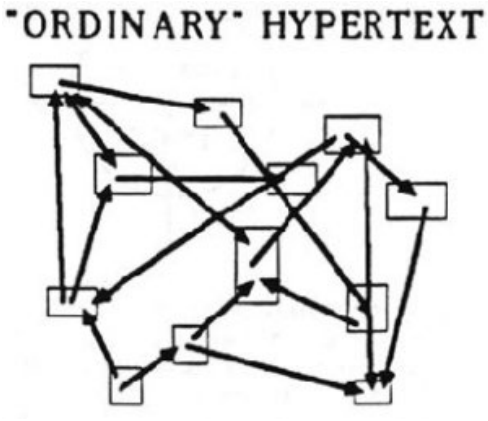
For instance, when the March 1949, issue of Popular Mechanics surveyed the then state of the art ENIAC computer (from "Electronic Numerical Integrator And Computer"), the potential impact of the transistor, let alone the microprocessor chip, was entirely missing:

Where a calculator on the ENIAC is equipped with 18,000 vacuum tubes and weighs 30 tons, computers in the future may have only 1,000 vacuum tubes and perhaps weigh 1.5 tons.

Ted Nelson – Hypertext Envisioned and Pursued

Ted Nelson

Another element of the information management challenge that Bush understood was the fact that quickly finding information through data compression and advanced displays didn't solve the need to move with ease from one type of pertinent information to different, but related, information. He recognized that there remained a need for a human/machine interface that more realistically mirrored the way people thought.

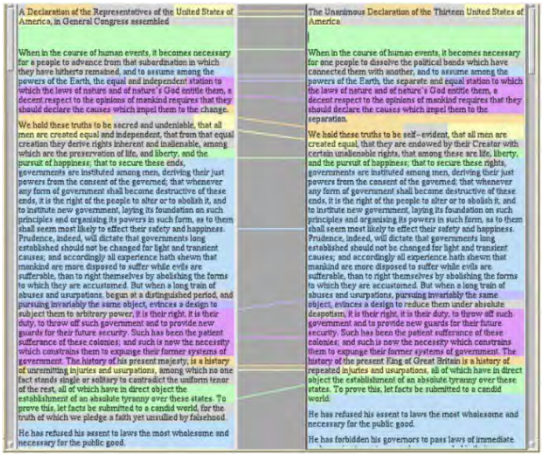


And, so, in one final burst of creative insight, Vannevar Bush dreamed up what we call today "hypertext" or "hyperlinking." That's the highlighted text or interactive graphic on a computer screen that, when clicked upon with a mouse, takes the user to related information stored in a different location.

Bush saw that static indices were an imperfect way to search for and access information and what was needed was a more direct way of moving from one thought to a related one. He understood that a major limitation in quickly accessing desired information

was the absence of ways to associatively access that information. In short, he saw the need for a random-access mechanism that would also provide quick connections to related information in different locations– hyperlinks as we now refer to them. As Bush put it:

Mere compression, of course, is not enough; one needs not only to make and store a record but also be able to consult it. Our ineptitude in getting at the record is largely caused by the artificiality of systems of indexing. When data of any sort are placed in storage, they are filed alphabetically or numerically, and information is found (when it is) by tracing it down from subclass to subclass. It can be in only one place, unless duplicates are used; one has to have rules as to which path will locate it, and the rules are cumbersome. Having found one item, moreover, one has to emerge from the system and re-enter on a new path. The human mind does not work that way. It operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain. Selection by association, rather than indexing, may yet be mechanized.



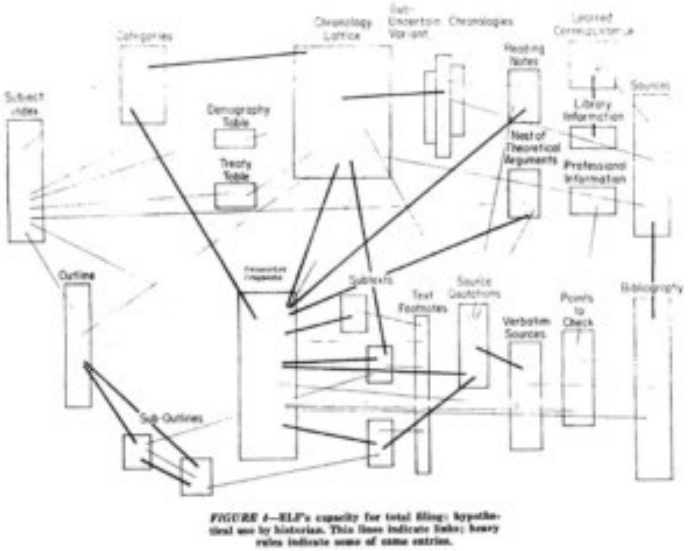
Xanadu Showing Changing Drafts of the Declaration of Independence

While Ted Nelson's software concept named Project Xanadu, was unable to be reduced to practice notwithstanding decades of fitful development, researchers today look back on Nelson's ideas about hypertext as influential in how people thought about computer interface concepts and the potentially revolutionary nature of hyperlinks.

Ted Nelson's parents were Hollywood royalty. Father Ralph Nelson directed the 1963 movie *Lilies of the Field* that led to Sidney Poitier winning the Academy Award for Best Actor. His mother was actress Celeste Holm who was nominated for her performance in the 1950 movie *All About Eve*. With a BA in philosophy from Swarthmore College, a small liberal arts school in Pennsylvania founded by Quakers, Nelson started graduate school in sociology in 1959 at the University of Chicago. Moving on to Harvard, he received his MA in 1962.

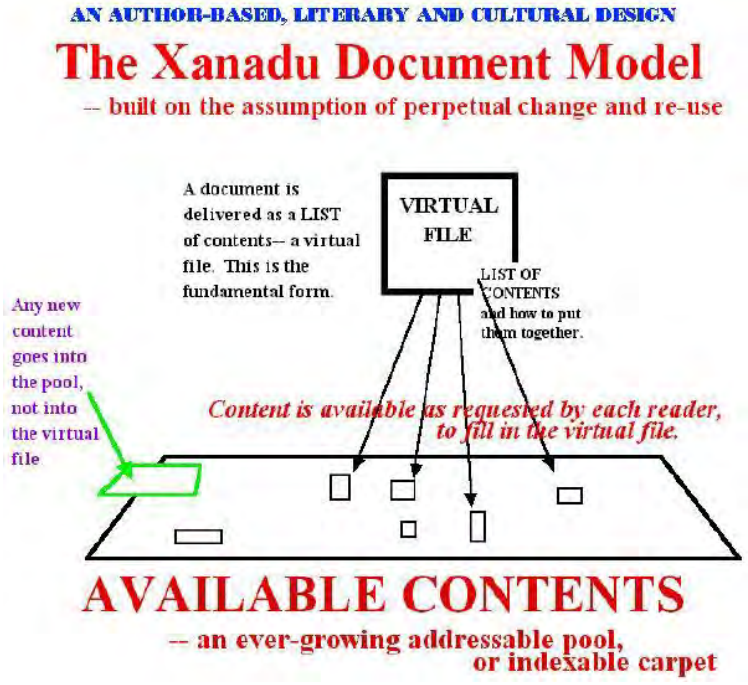
It was at Harvard that he began to work on a "writing system" that would let people store what they had written, change it, and print it out. His concept included being able to see alterations in a side-by-side format that would also retain the train of changes. As Project Xanadu evolved through the decades of the unsuccessful effort to produce a useful and commercial software product, hints of what could be in store were evident, but never made workable.

Nelson used the term “hypertext” in several papers he published in 1965. Though the code for Xanadu could never be written that would make dream come true, the search went on to find a workable way to usefully connect non-sequential text. Nelson published his ideas in a paper submitted to the Association for Computing Machinery in 1965. He further developed them in his books *Computer Lib/Dream Machines* (1974) and *Literary Machines* (1981).



In the 1950s and 1960s, the utility seen in the foresight and musings of Bush and Nelson was still far away given the state of computer development at the time. This was the era of big iron, as the IBM and other mainframe computers were known. Even with their growing power and scale, they could not yet manage the facile integration of images with text, let alone coupling them with sound and video. While continuing to develop, the speed and processing power of big iron’s central processing units remained limited in their utility.

On the storage end of things. magnetic drum memory devices had come to market in 1950. They functioned by storing information on the outside of a rotating cylinder coated with ferromagnetic material. This was circled by read and write heads that remained in a fixed position.



Douglas Engelbart-The Mouse and Graphical User Interface

Douglas Engelbart was born in Portland, Oregon, in 1925. When he died in 2013, Ted Nelson gave an impassioned eulogy at his memorial service. You get a good view of Nelson's charismatic personality as he rails against the forces he believes held himself and Engelbart back during their lives.

Engelbart had been drafted into the Navy in World War II, where he had served as a radar technician. Perhaps his familiarity with cathode ray tubes prepared him for the role he was to play later in the evolution of the visually centric human/computer interface. While awaiting discharge from the Army in the Philippines at the end of the War, he had read Bush's article, "As We May Think." As it turned out, Bush's precepts remained at the center of Engelbart's later career in computer science. When he got home, he pursued an education in electrical engineering, receiving a B.S. from Oregon State University in 1948 and a Ph.D. from the University of California, Berkeley, in 1955.

After 1957, when the Soviet Union launched Sputnik, the first earth orbiting satellite, the U.S. government, through the Department of Defense's Advanced Research Projects'Agency (ARPA), and the Air Force Office of Scientific Research made funds available to further research in computer science. Engelbart had joined a group at the Stanford Research Institute (SRI) in Menlo Park, California, and in 1962, under a contract with the Air Force Office of Scientific Research, wrote a seminal

paper building on Vannevar Bush's earlier concepts. In the paper *Augmenting Human Intellect: A Conceptual Framework*, he sketched out the basis of his advanced thinking on the development of a human/machine interface.

The paper cites Bush's Memex as important in thinking about next steps not in building a better computer, but in building a better way for humans to interact with the machines so as to leverage the unique powers of human intellect so that it can be efficiently applied to analyze the vastly increasing body of mankind's knowledge. Engelbart writes in the paper:

> The Memex adds a factor of speed and convenience to ordinary filing-system (symbol-structuring) processes that would encourage new methods of work by the user, and it also adds speed and convenience for processes not generally used before. Making it easy to establish and follow the associative trails makes practical a new symbol-structuring process whose use can make a significant difference in the concept structuring and basic methods of work.

It is also probable that clever usage of associative-trail manipulation can augment the human's process structuring and executing capabilities so that he could successfully make use of even more powerful symbol-structure manipulation processes utilizing The Memex capabilities. An example of this general sort of thing was given by Bush, where he points out that the file index can be called to view at the push of a button, which implicitly provides greater capability to work within more sophisticated and complex indexing systems.

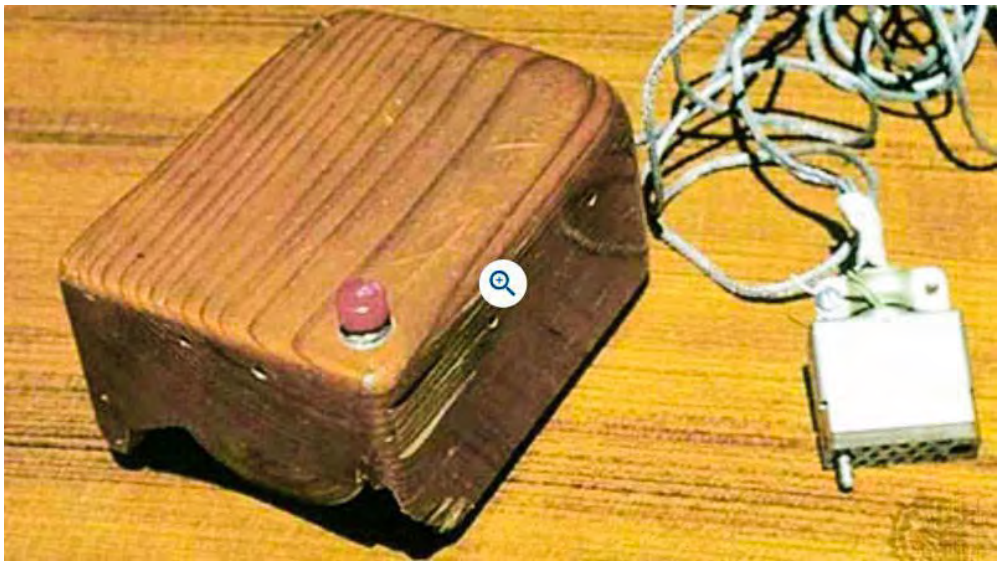
Later in the 1960s, Engelbart and his colleagues at SRI, particularly William K. English and John F. Rulifson, created what they called the "Online System (NLS)." They also developed a graphical user interface (GUI, pronounced "gooey") to facilitate operating it.

In the 1960s, in corporate America, universities and the government, "big iron" IBM mainframe computers ruled. Input into computers was still done largely through punch cards. Output was typically paper as well. Standard computer output to a visual device was still a printout.

These machines were not for ordinary folk, as they were almost entirely devoted to a triad of commercial, scientific, and number crunching users. It was quite a departure for Engelbart and his band of software engineers to focus on a highly visual interface, one

that even lay people might master. Their unique approach to GUIs and computing led to the development of basic tools such as the mouse, hypertext linking and word-processing in a windows environment.

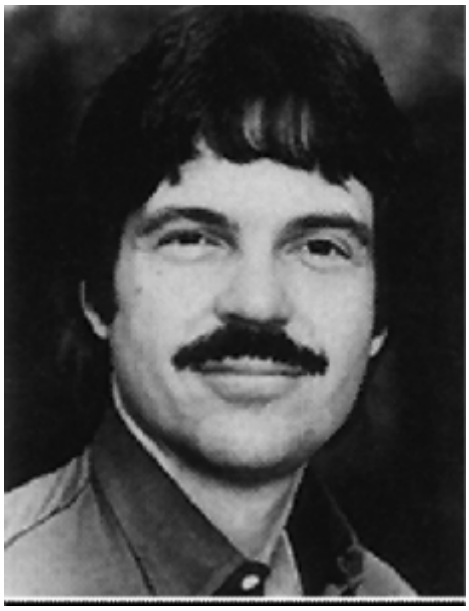
On December 9, 1968, Engelbart demonstrated his NLS at the Fall Joint Computer Conference in San Francisco. Those who witnessed his use of a keyboard, display screen and mouse knew they were present at an unusual moment. It's not surprising that footage from this event was later put on display at the Smithsonian Museum's exhibit on the Information Age. The combination of the mouse as a tool to interact with the display screen was a giant home run for those present and for the generations of computer users to follow.



Alan Kay

The Department of Defense's Advanced Research Project Agency funding of SRI's work dried up in the early 1970s. When Engelbart's Stanford Research Institute activity center closed in 1977, a number of its computer researchers moved on to Xerox Corporation's Palo Alto Research Center (PARC) to carry on their work on human/computer interfaces.

PARC researchers, including notably Alan Kay, continued to focus on marrying graphics and animation to computer systems. They also thought about simpler interfaces that even children could interact with. Pertinent to Britannica, Kay would also focus later on the likely nature of an electronic encyclopedia.



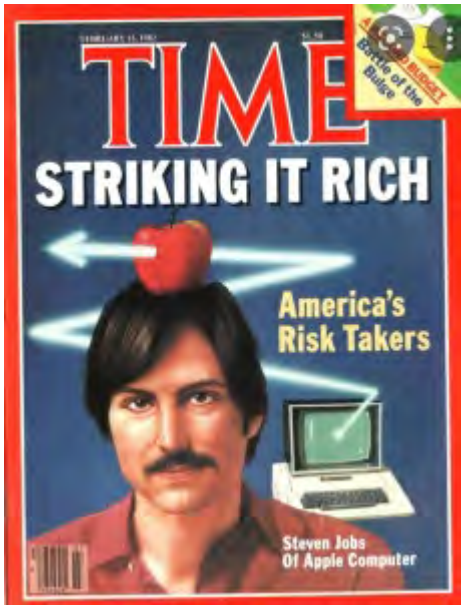
Kay's early education had had a lot to do with computers. After a tour in the Air Force working on IBM computers, Kay had enrolled at the University of Colorado, receiving his undergraduate degree in mathematics and molecular biology in 1966. In 1969, he received his PhD in computer science from the University of Utah. His thesis was about graphical object orientation. After teaching two years at the Stanford Artificial Intelligence Laboratory, Kay moved on to PARC, where he focused on bitmap displays, windowing, and the point-click-and-drag user interface.

When Steve Jobs and his colleagues at Apple visited PARC in 1979, they saw the future of computing in what Kay and his colleagues

had been working on. Apple's later unique graphical user interface reflected PARC's cutting edge approach to interface design. Not surprisingly, Kay later served Apple directly as a research Fellow, before serving in a similar capacity for The Walt Disney Company, and, beginning in November 2002, for Hewlett-Packard. Through the work of Nelson, Engelbart, Kay and many others, Bush's early ideas about advances in computing technology evolved and, by the early 1980s, computing machines had begun to enter the consumer mainstream.

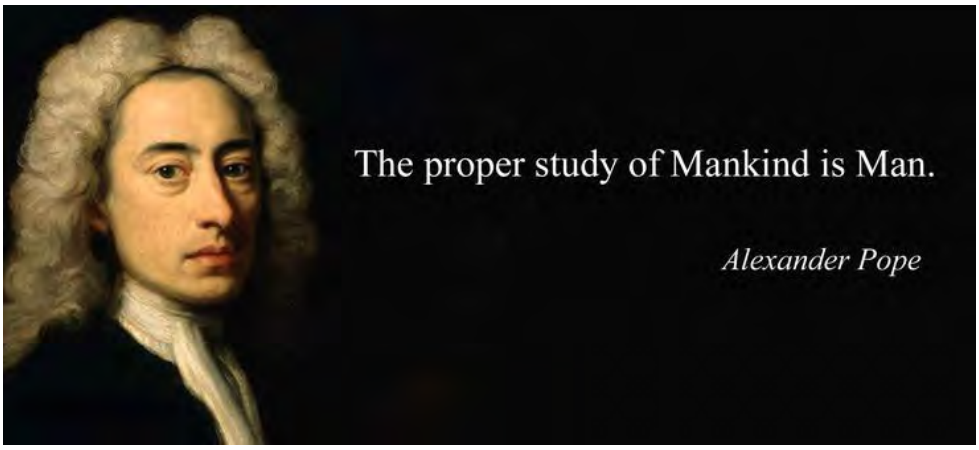
However, the prevailing operating system displays of the day were still arid and text centric. There were no high resolution or color displays. Also missing was the much larger local storage capacity required to play the game of dynamic knowledge management.

As a result, dreaming up a theoretical machine with an interface for ordinary folk and filled with programs rich in data and loaded with computer-based hyperlinks remained much easier to do than actually building one. Many such as Ted Nelson and Alan Kay had begun to think the interface side of things through. Kay in particular gave extended thought to construction of a complex encyclopedic database.



However, the stage had been set for the big breakthrough: computers built for the consumer market. Louisiana Senator Huey Long's depression era campaign promise of "a chicken in every pot" became "a computer in every home" for Apple and IBM in the 1980s. Time magazine made the IBM Personal Computer "Machine of the Year" in 1981, and the next year Steve Jobs of Apple made the cover. This was testament to the fact that the computer finally was moving out of its prior confines of big government, big business, and big universities and into the home.

The Proper Study of Mankind



Although a print publisher throughout its long life, Encyclopaedia Britannica had been keeping abreast of these computer developments closely. When the first CD- ROM (for Compact Disc-Read Only Memory) storage discs came out
in 1985, Britannica had just put the finishing touches on its multi-decade, massive rewriting of its 1928 14th Edition. The 15th Edition had originally been published in 1974 in a 30-volume set. The 15th Edition was structurally rounded out n 1985 with the addition a separate, two-volume index to the 15th Edition.

This redesign of the *Encyclopaedia Britannica* in the several decades before the CD- ROM-based *Compton's Encyclopedia* launch was a critical precursor to EB's invention. The Britannica multimedia search system patent would not have been possible without the specialized learning that grew out of the computer-assisted design of the 15th Edition print set. When the Compton's Patent was reissued by the Patent Office in 2002 after a lengthy reexamination, the stage was set for Britannica to exploit its achievement monetarily.

English poet Alexander Pope began the second epistle of his 1732 work *An Essay on Man* with this couplet:

> Know then thyself, presume not God to scan; The proper study of Mankind is Man.

His reference to our genome-embedded drive to understand ourselves and catalog our knowledge is symbolized and given tangible shape by the encyclopedic form. The long, continuous history of the encyclopedia in our civilization is evidence that our collective need for self-examination is hard- wired into our brains.

Thus, the presence of a reference publisher at the center of a critical human/machine interface development in the 1980s was not entirely an accident. It stemmed in part from the very nature of encyclopedias in modern society.

The word “encyclopedia” comes from the Greek words enkyklios, meaning general, and paideia, meaning education The effort to create a system of knowledge or circle of learning in the form of an “encyclopedia” spanning humankind’s knowledge has been with us for over 2,000 years, although it hasn’t always been called this. Speusippus, who died in 339 BC, recorded his uncle Plato’s thinking on natural history, mathematics, and philosophy. Speusippus also apparently attempted to record detailed descriptions of different species of plants and animals.

However, it was Denis Diderot’s *Encyclopedie ou Dictionnarie raisonne des Sciences, des Arts, a et des Metiers*, published in 1751 in Paris, that first popularized the use of the term encyclopedia to describe works containing a broad compendium of knowledge. Shortly thereafter, in 1768, the first edition of the *Encyclopædia Britannica*, the oldest and most comprehensive English- language encyclopedia, was published in Edinburgh, Scotland.

The Encylopaedia Britannica First Edition

The 1768 First Edition of the Encyclopaedia Britannica

The three-volume First Edition of the *Encyclopædia Britannica* paid homage to its classical roots in two conspicuous ways. One was a departure from the conventional spelling of *encyclopedia.*

The use of the *æ* ligature preserved an ancient bequest of Greek and Roman scribes used to denote diphthongal pronunciation. Even by 1768 this device had fallen out of use except in the most rarefied of contexts.

The other nod to antiquity was the Latinate title itself. It could easily have been called the *British Encyclopedia*, since Latin had long ceased to be the lingua franca of the educated. In the more than two and a half centuries years since that first edition, *Britannica's* stewards have continually changed everything else about the work, but they have always left its unusual title untouched.

The current 15th Edition was first published in 1974. The last print set bore the 2010 year on its copyright and the permanent cessation of printing the *Encyclopaedia Britannica* was announced in 2012.

Although there were regular revisions of print editions published, since the 1930s, readers typically kept their sets up to date by annually by buying yearbooks that review recent developments.

Today, the *Encyclopaedia Britannica* is available to a global audience never dreamed of in the history of the print set. In the current era, the online version of *Encyclopaedia Britannica* receives over 7 billion annual page views, in more than 150 countries, with in excess of 150 million students using it in more than 20 languages.

The Encyclopedist's Art

Editor Philip W. ("Tom") Goetz

In the twentieth century, encyclopedists were not been the only people to worry about how to facilitate access to an ever-growing sum of knowledge. The problem arising from the information explosion of modern times was also noticed by those who helped create it. In particular, the scientists and mathematicians who had created whole new disciplines of knowledge, such as atomic physics and computing machines, had also begun to think about how to increase efficient access by their colleagues and lay people to growing domains of information.

Since the mission of an encyclopedia is to encompass in an abbreviated and accessible form all of our knowledge about everything, the editorial investments needed to create encyclopedias have always been substantial. As a result, the number of encyclopedias has always been relatively few. Also, while there are several thousand distinguished outside contributors asked to write articles for an encyclopedia such as the *Britannica* (more than 4,000), there is a much smaller number of career encyclopedists charged with the actual design and creation of the work and its ongoing revision.

Mortimer Adler (with cane), Editor Philip W. "Tom" Goetz (with red bow tie) with Britannica's officers and wives, Christmas 1990

In the modern era, professional encyclopedists around the world working continuously in the English language have mostly numbered in the hundreds rather than the thousands. And for over two centuries, the encyclopedists at Britannica have remained the most skilled and respected of their breed. The task of an encyclopedist is an odd one. There are not many of these folks around, and the few that around tend to spend their days in single-minded thought on how best to organize a brief, narrative summary of our cumulative understandings of history, art, literature, science, religion, philosophy, and culture.

The encyclopedist's art has traditionally been more of what to leave out, rather than what to put in.

During my 28-year tenure at Britannica, I had the privilege of working frequently with EB's Editor for much of that time, Phillip W. ("Tom") Goetz.

He had been promoted to Editor well before the day I arrived in 1986. He had been the second-in-command Executive Editor during the development of the 15th Edition. When I once asked him about what that period was like, he said it was the toughest job he ever had to slog through. The complete rewriting of the 14th Edition had begun in the 1950s and the 15th Edition wasn't published until 1974. During that time, Goetz said that, to insure the entire corpus of over 30 million words had editorial consistency and "spoke with one voice," he was detailed to be the one person to read and give final approval to all of the 44 million words in the 65,000 articles in the complete set of 32 volumes, with each volume having more than 1,000 pages.

Goetz was possessed of an exceptional intellect and engaging manner and he never forgot a lot of what he had read, either. Once, when we had a problem with the development of an Italian translation of *Encyclopaedia Britannica*, I travelled with him to Milan. Arriving on a weekend, we decided to check the common tourist box of visiting the Milan Cathedral. I was particularly anxious to see it as my mother had taken a snapshot of the church on her honeymoon in 1928. Begun in 1386 it had been added to and refined over the next six centuries.

To take in the exceptional view of Milan from the top of the Cathedral, we climbed the 250 steps to the Duomo roof. As we strolled amongst the marble forest of statues and gargoyles, Tom had been filling me in on aspects of the Cathedral's construction. When I asked him what had been going on in the Catholic Church at the time of construction and the years immediately following, my casual question did not elicit a casual answer. It was all in his head and he poured it out to me in excruciating detail for the next hour, formulated in perfect paragraph-like sections.

It was an amazing and thorough education for me. While it had been completely casual for him to speak off the cuff as he did, he spoke with the command of a specialist university professor who might have spent their entire career studying and lecturing on the Middle Ages.

Architects of the 15th Edition

William Benton, EB Owner and Publisher

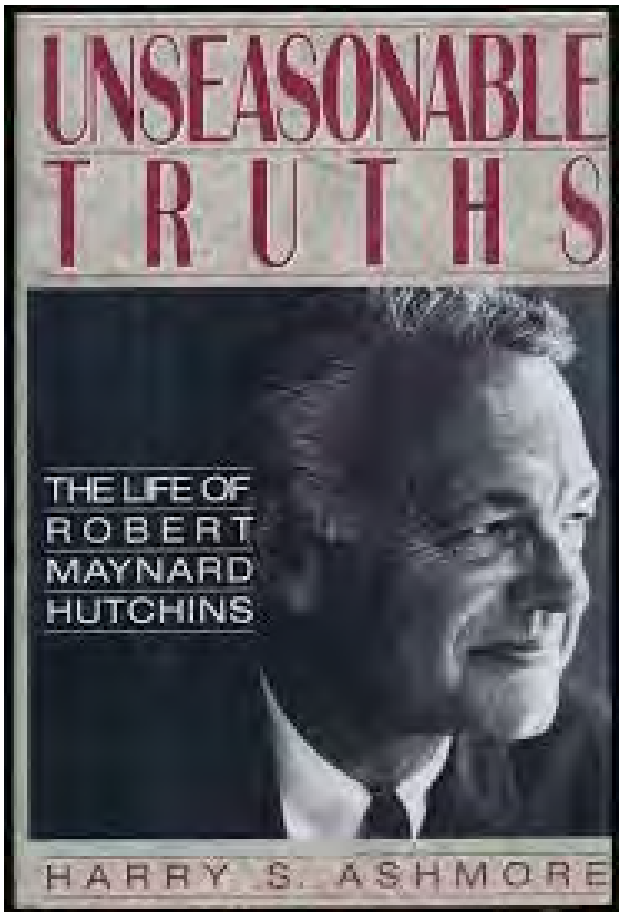
William Benton

Paralleling this whole development of the computer, encyclopedists at Encyclopædia Britannica had thinking long and hard about the proper structure of a modern encyclopedia and how it might be conjoined with an appropriate human/machine interface adapted to the electronic age.

The 14th Edition of the *Encyclopædia Britannica* had been published in 1929, when the company was owned by Sears Roebuck. That same year William Benton founded the Benton and Bowles advertising agency in New York City. The agency prospered with the growth of network radio and its own innovations in the development of national advertising. Among other things, Benton & Bowles is credited with inventing the radio soap opera, which it used as a vehicle to sell its clients' products.

Benton, later a vice president at The University of Chicago, used the proceeds from his sale of Benton & Bowles to acquire Britannica in 1943, after Sears failed at gifting the company to the University.

Robert Hutchins, University of Chicago President

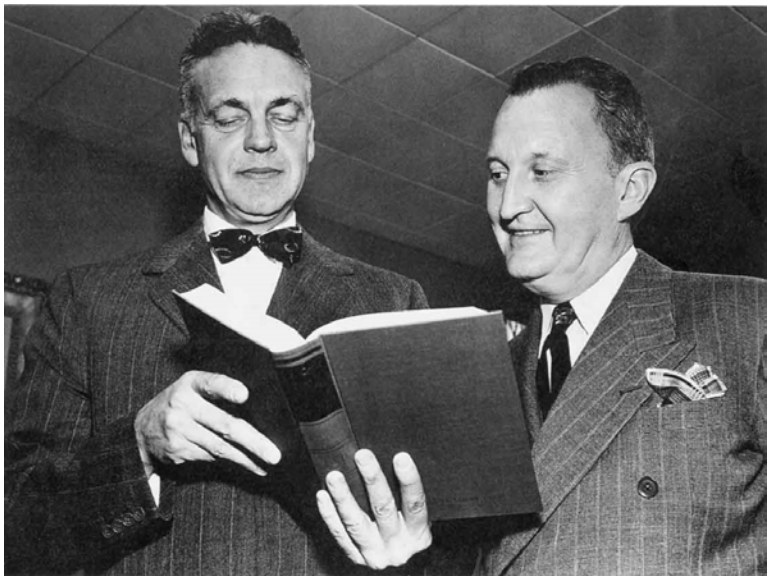


Robert Maynard Hutchins

Benton had been recruited to the University of Chicago in 1937 by his fellow student in the Yale College Class of 1924, then Chicago's president, Robert Maynard Hutchins. Hutchins was one of the 20th Century's most prominent intellects and educators. A true prodigy, Hutchins had been named dean of the Yale Law School at the age of 28. He was only 30 at the time of his appointment as Chicago's president in 1929.

The University's trustees said notably as they turned down the Sears offer to gift Encyclopaedia Britannic to the school that the University was in the business of education, not the business of business. Bill Benton knew a good commercial opportunity when he saw it, however, and he seized both the moment and the company.

When Benton purchased Britannica, he agreed to pay the University a 3% royalty on U.S. encyclopedia sales in return for the editorial advice of its faculty. Not long thereafter, Benton appointed Hutchins Chairman of Britannica's Board of Editors. The University of Chicago's connection to Encyclopædia Britannica lasted more than five decades. Thanks to the simpatico relationship of Benton and Hutchins, it brought the University's endowment more than $200 million in that time

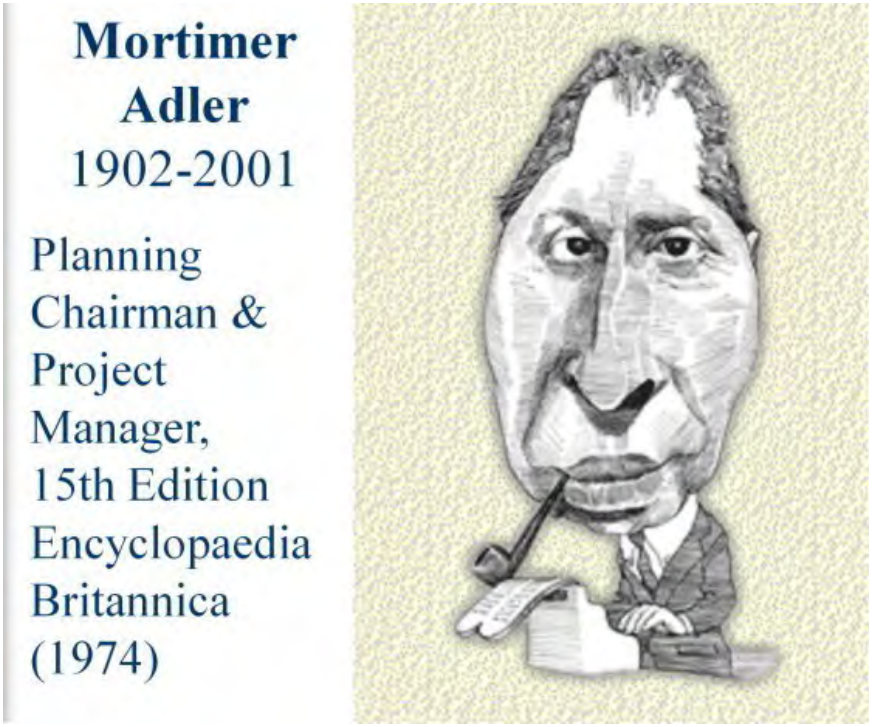


Robert Hutchins and William Benton

In 1974, after an investment of more than $33 million, the 30-volume, 44- million- word 15th Edition of *Encyclopaedia Britannica* was published. The event made the front page of the *New York Times*. The standalone two-volume index was added to the set as part of a major revision published in 1985 partly because of complaints from librarians.

Charles Swanson, EB President (he interviewed and hired me as Vice President and General Counsel of EB in November 1984), William Benton, EB Owner and Publisher, Robert Hutchins, President, University of Chicago and Chairman of the EB Board of Editors

Mortimer Adler, Philosopher



Mortimer Adler

Mortimer J. Adler, a precocious student (and later critic) of philosopher John Dewey at Columbia University, had also been attracted to the University of Chicago in the 1930s. Hutchins had found appointments for him in philosophy and psychology and at The University of Chicago Law School.

Adler was an evangelist for a broad, liberal education and a strident critic of the disciplinary specialization just then coming to fruition at American universities. His and Hutchins's impassioned arguments for an undergraduate curriculum based on the classic texts of Western civilization touched off years of stimulating, though acrimonious, debate at the University in the 1930s. Adler's belief in exposing undergraduates to the classics fell in with Hutchins' view that, "What the nation needs is more educated B.A.'s and fewer ignorant PhD's."

Wags on the Midway soon were quoted reciting, “There is no God but Adler, and Hutchins is his Prophet.” Students also were heard singing an old New Year’s standard with a new refrain, “Should auld Aquinas be forgot.”

Adler later helped Hutchins complete editorial work on Britannica’s unique 54-volume canon of Western intellectual history, *Great Books of the Western World*. The set was published in 1952, the same year Adler left The University of Chicago. Notwithstanding its intellectual gravitas (from Homer, Aristotle and Aquinas to Freud), Britannica sold “Benton’s Folly” to ordinary Americans with great success.

Mortimer Adler (with cane), EB Officers and wives
Christmas 1989

By the early 1960s, the 14th Edition of *Encyclopædia Britannica* was showing its age. Benton, by this time, had also been an Assistant Secretary of State (he thought up the Voice of America), and a United States Senator (a Democrat from Connecticut and the first to denounce Senator Joe McCarthy).

After Hutchins left the University of Chicago, he headed the Fund for the Republic think tank, established with help from the Ford Foundation. The Fund had helped finance Adler's Institute for Philosophical Research in San Francisco. When Benton was assembling his editorial team to prepare the groundwork for the 15th Edition, he found Adler in San Francisco, where he was finishing his two-volume work, *The Idea of Freedom* (1958-61).

In December 1962, as Adler celebrated his 60th birthday, his Institute was going nowhere, his marriage had failed, and he was in debt. Thus, he was in a receptive mood when William Benton reached out:

> Come back to Chicago, Mortimer, and help me make a new and greater *Encyclopædia Britannica.* I'll not only pay you a princely salary and fund the Institute, but I also support a series of Benton Lectures at The University of Chicago that can be the first step towards a new career for you—and an education for them.

Charles Van Doren, EB Editorial Vice President

Charles Van Doren

The year 1962 was also a watershed year for Adler's young friend and acolyte Charles Van Doren. In that year, Van Doren had received a suspended sentence following his conviction in New York State for perjury in the investigation into the fixed television game shows of the late 1950s.

As a sign that he was looking to the future, Van Doren published a scholarly article, "*The Idea of an Encyclopedia*," in *The American Behavioral Scientist* that same year. In the article, Van Doren argued that American encyclopedias should no longer be mere compilations of facts (a criticism of the 14th Edition). He said they should educate, as well as inform. He also argued against encyclopedias that classified information in artificial pigeonholes reflecting university politics, and spoke in favor of celebrating the natural interrelatedness of man's knowledge:


York Times. LATE CITY EDITION

VAN DOREN ADMITS LYING, SAYS TV QUIZ WAS FIXED; LOSES HIS COLUMBIA POST

COACHING BARED

Teacher Fears He Has Done Disservice to All in Education

Resignation Is Accepted; $50,000 TV Job in Doubt

It takes a brave man to master more than one discipline nowadays; bravery is not totally absent from our society, and so heroes can be found. But the man who attempts to find the principals which underlie two or more disciplines is considered not brave, but mad or subversive. Those whom graduate schools have put asunder, let no man join together!

Van Doren's article on encyclopedic form was influential enough to be selected for inclusion along with Vannevar Bush's 1945 *Atlantic Monthly* essay, in the 1967 compilation, *The Growth of Knowledge: Readings on Organization and Retrieval of Information.* This book also took note of the theoretical work being done in automated text retrieval by Gerald Salton of the Department of Computer Science at Cornell.

When Adler moved back to Chicago to join Britannica in 1962, it is not surprising that he quickly found a place for the would-be encyclopedist Van Doren. Van Doren was a son of Adler's old Columbia University teaching colleague and friend, poet Mark Van Doren, and Adler had known him since birth. As Charles Van Doren put it when he spoke at a 2001 memorial service following Adler's death at age 98:

> And then there came the time when I fell down, face down in the mud, and he picked me up, brushed me off and gave me a job. It was the best kind of job: As he described it, one you would do anyway if you did not need the money. First, we worked together making books for Encyclopædia Britannica. Then I, and many others, helped him to design and edit the greatest encyclopedia the world has ever seen.

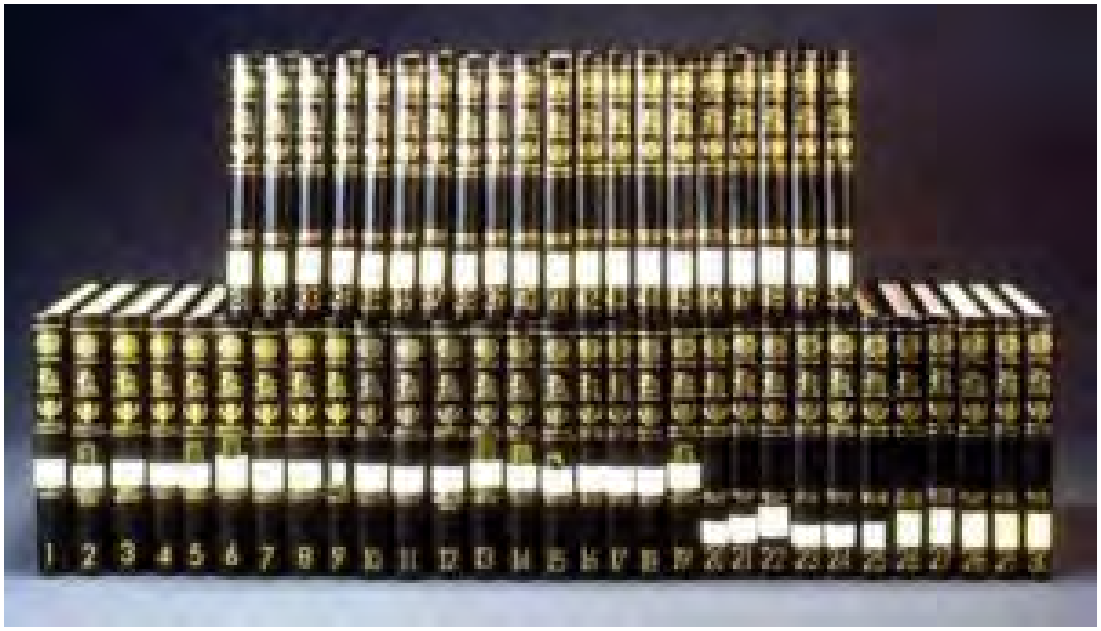
Charles Van Doren at his 1981 EB retirement party with EB librarians Terry Miller and Shanta Uddin

The source of Van Doren's infamy permeated the rest of his life, including his career as an editor at Britannica. At the same time I joined Britannica as General Counsel in 1986, Peter Norton succeeded Chuck Swanson as President of the company. When I once asked Norton about Van Doren's time at EB, he said a few times he had heard a mean spirited person hum under their breath Dum, Dum, DUM! Dum, Dum, DUM! when Van Doren entered a room. This was the sound of the drums heard on Twenty-One when Van Doren had been struggling with an answer.

The appearance of Van Doren at his mentor Adler's memorial service was a rare public outing. In the 45 years since his 1956 elevation as the new champion of the rigged TV game show Twenty-One, he had avoided the limelight with the exception of his 1959 Congressional testimony before the House Subcommittee on Legislative Oversight. His later career writing books with Adler and as Editorial Vice President of Britannica was notably out of the public eye. He had retired from EB in 1982, four years before I arrived.

Dum, Dum, DUM! Dum, Dum, DUM!

As Executive Vice President of Britannica as well as General Counsel, from time to time I managed a number of relationships with the partners around the world who were publishing translations of the *Encyclopaedia Britannica* into different languages. Usually this was when something in the relationship was going terribly wrong. So, when I began dealing with a copyright infringement of the *Encyclopaedia Britannica* in Greek, I dove into the files to read the correspondence and contractual underpinnings of EB's relationship with our Greek licensee. What I found was that I was walking in Van Doren's footsteps. In the 1970s he had negotiated and concluded a very complicated agreement that had substantially benefitted both EB and its licensee over the intervening years.



Pirated Encyclopaedia Britannica in Greek

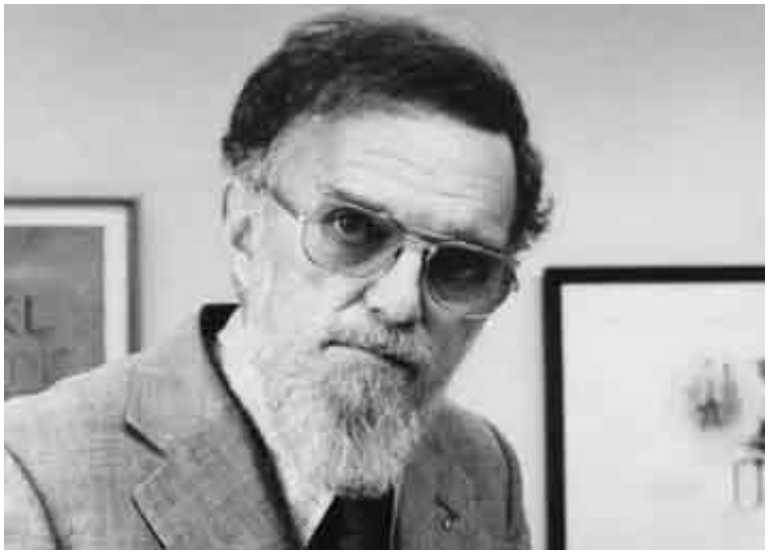
With this background in mind, after Adler's funeral service I had a chance to chat with Van Doren. As I had also worked with Adler over the years, I told him I thought he had captured the man nicely in his remarks. When I told him that the Greek language version of the *Britannica* he had nurtured was still going strong, his eyes lit up as he briefly and enthusiastically spoke about his EB career.

Apart from his comments about Adler, he was rarely heard from in all the years following his humiliating confession before Congress in 1959. One exception was when he made remarks at the 50th Reunion of his class at Columbia University in 1999. At that time, he said:

> Some of you read with me forty years ago a portion of *Aristotle's Ethics*, a selection of passages that describe his idea of happiness. You may not remember too well. I remember better, because, despite the abrupt caesura in my academic career that occurred in 1959, I have gone on teaching the humanities almost continually to students of all kinds and ages. In case you don't remember, then, I remind you that according to Aristotle happiness is not a feeling or sensation but instead is the quality of a whole life. The emphasis is on "whole," a life from beginning to end. Especially the end. The last part, the part you're now approaching, was for Aristotle the most important for happiness. It makes sense, doesn't it?

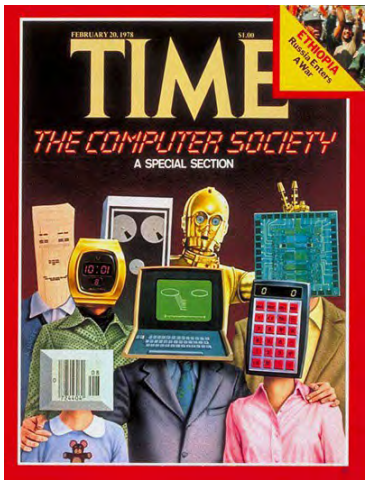
Van Doren died in 2019 in a Connecticut Retirement Community at the age of 93.

Reinventing the Encyclopedia in Electronic Form



Warren Preece, Editor, Encyclopedia Britannica

In 1981, Britannica's now retired Editor, Warren Preece, published "*Notes Towards a New Encyclopedia*." In this article Preece described the coming electronic encyclopedia.



Time Special Edition 1978

As one of the architects of the 15th Edition, Preece was intimately familiar with the dense tapestry of cross references that connected related pieces of information spread throughout the Micropaedia, Macropaedia, and Propaedia, the three parts of the encyclopedia. He,more than most, was in a position to ponder the way in which the electronic publishing future might affect a corpus of this nature, and he explored the contours of these possibilities in his article.

Not only did Preece write that his newly envisaged encyclopedia would have an electronic version, but he also saw what Bush had not been in a position to see: optical laser-disc technology could be the likely storage medium for encyclopedic data. Preece also noted that with over 300,000 home computers then in private use in the U.S., online query privileges for up-to-date encyclopedic information were another possible direction for the encyclopedia of the future to take. He also was attuned to certain competitive advantages an electronic encyclopedia would have over the book: it could hold more, be searched faster, and be updated more easily.

Charles Van Doren with Lexis Nexis terminal 1981

At Britannica, Van Doren was already leading the charge into Preece's Brave New World. In May 1980, he had circulated to his colleagues a new agreement between Britannica and Mead Data Central. The four- year agreement called for the full text of the *Encyclopædia Britannica* to be put online as part of the Lexis-Nexis service. Mead was to pay Britannica up to 25% of Mead's revenues from encyclopedia subscriptions. While being careful to discourage copyright infringement by not permitting subscribers to print articles from the encyclopedia, Britannica had now committed itself to an electronic future in more than a symbolic way.

Solving the PC Data Storage Problem

The CD-ROM was jointly invented by
Philips Electronic NV and Sony Corporation in 1980

Britannica editor Warren Preece had been able to foresee the possibility of an optical disc encyclopedia because of breakthrough engineering developments that had taken place in Europe and Japan. Klass Compaan, a physicist with Philips research, based in The Netherlands, had conceived of the compact disc in 1969 and, with Piet Kramer, had produced the first color videodisc prototype in 1972. Philips then worked with Sony to develop a smaller compact disc standard for just storing audio signals.

The audio compact disc that emerged was made with a polycarbonate substrate, molded with pits that permitted a laser beam to read timing and tracking data. The so-called Red Book format of the compact disc was released in Japan and Europe in 1982, and in the U.S. the following year. A derivative format, designed to hold multimedia information and be played back on a computer was given the unwieldy name Compact Disc-Read Only Memory, CD-ROM for short. This was launched into the nascent personal computer market in 1985, several years after the first prototypes had been shown.

Sony Corporation CD-ROM Player

Grolier Publishing quickly put a text-only encyclopedia on a videodisc and also a CD-ROM in 1985. Most early CD-ROMs published were specialized compendia designed for commercial, not consumer, use. Navigation was accomplished through rules-based Boolean text string searches. Discs with sound, pictures, video and animation, although supported by the CD-ROM format, were not available.

Microsoft believed that for sales of its operating system to grow at an exponential rate, software developers needed to be encouraged to use the new CD-ROM storage media to create compelling software for consumers. The assumption was that this would drive consumers to regard PCs in the home not just as gaming facilitators, but as a requirement for their children's education. To this end, Microsoft showed off a CD-ROM multi-media encyclopedia demonstration disc at a CD-ROM developer's conference it held in 1986. The dozen five- page articles on the demonstration disc contained text, graphics, sound, a motion sequence and animation.

Compton's Multimedia Encyclopedia Prime Movers:

Patricia Wier, EB, Marvin Minsky, MIT & Alan Kay

Patricia Wier

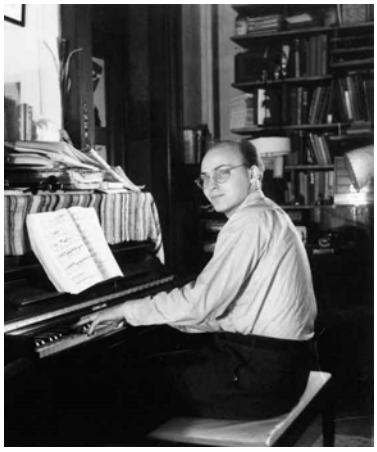
Britannica had first acquired a large mainframe computer in the 1960s. It had primarily been used to manage the company's direct mail and installment sales activities, though it also did the usual accounting applications and managed the payroll and accounts receivable functions. In 1971, Britannica hired Patricia A. Wier to help manage computer systems and programming operations. Wier had been lured away from a computer management position at Playboy Magazine's Chicago headquarters. A quick study, Wier was promoted to head Britannica's computer operations within the same year.

Wier was determined to broaden the use of computers within the company, and before long Wier helped graft the in-house editorial system onto Britannica's existing mainframe computer. This system was used to help produce the massive 15th Edition. It was not until the early 1980s, however, that Britannica moved to a stand-alone mainframe computer completely dedicated to editorial operations. At that time, all editorial and production work was put online, including page-makeup and indexing.

It was at this juncture that Wier was promoted to vice president of corporate planning and development. She was charged with developing or acquiring new products that would see Britannica into the future, particularly bearing in mind the new computer technologies that were coming to the fore. Soon she and editorial vice president Charles Van Doren began calling on various leading lights in the field of computer development to get ideas about the directions Britannica electronic products might take. Because Wier wanted to explore at a sophisticated level how the computer developments of the future might be put to use by a reference publisher such as Britannica, she traveled to the Massachusetts Institute of Technology.

MIT was then, as it is today, at the cutting edge of important computer developments. The people that she engaged at MIT included “artificial intelligence” guru Marvin Minsky at the MIT Media Lab. Minsky introduced her to a former student of his, Danny Hillis, by then at the supercomputer start up Thinking Machines. Both were intrigued with how computer technology might be applied to such an enormous and fascinating database as the *Encyclopædia Britannica*. Of particular interest to everyone Wier met was the dense indexing within the set that already existed, interconnecting as it did all parts of the database.

Wier recalls that when she met with Minsky at his home in Brookline, Massachusetts, and entered the large casual room where their meeting was to take place, three grand pianos scattered around the room sounded the opening chords of Beethoven’s Fifth Symphony as the door opened. Minsky had other gadgets like this in his home, all reflecting his never-ending fascination with technology and its uses, both playful and serious. Grand pianos seemed the order of the day among these leading east coast technologists.



Marvin Minsky

When Minsky and Wier visited the home of Sheryl Handler, a co- founder with MIT graduate Danny Hillis of Thinking Machines, a supercomputer manufacturer. Minsky sat down at her new Bösendorfer grand piano and expertly indulged his passion for magnificent music machines.

Sheryl Handler Ad

Though all Wier's Boston-based interlocutors were singular, none could fully compete with one of Handler's achievements. She had appeared in a Dewars Scotch Whiskey advertising profile next to the quote, "My feminine instinct to shelter and nurture contributes to my professional perspectives."

Wier also met briefly at this time with Nicholas Negroponte, director of the Lab. Wier and others were curious about how to use what was then called artificial intelligence to permit the recovery of pertinent electronic data in a more sophisticated manner than through key word searching alone.

Wier also met briefly at this time with Nicholas Negroponte, director of the Lab. Wier and others were curious about how to use what was then called artificial intelligence to permit the recovery of pertinent electronic data in a more sophisticated manner than through key word searching alone.

During this period, Wier and then EB USA president Peter Norton also met with Alan Kay to discuss how rapidly developing computer technology might impact an electronic encyclopedia. At the time Kay was working with Atari to produce electronic games, but Wier recollects that he was fascinated with the content of Encyclopædia Britannica and came to Chicago to visit Britannica's corporate headquarters to learn more.

His sneakers and jeans, while standard mode of attire for Silicon Valley, caused heads to turn and eyebrows to raise at then straight-laced Britannica Centre. The requirements for more formal business garb at Britannica and other offices in downtown Chicago didn't disappear until well into the '90s. Wier and Kay, who had his own associations with the MIT Media Lab, also brainstormed about someday using encyclopedic information in voice-controlled graphics on walls in the home.

In 1983, with her research complete, Wier proposed to Britannica's board of directors that it embark on the creation of an interactive electronic encyclopedia. Wier, who retired in 1993 as president of Britannica USA, got an answer akin to the one given by the University of Chicago's directors when they turned down Sears' Britannica gift. Wier remembers she was told in no uncertain terms, "We sell books!"

Bill Bowe with William Benton's daughter Louise Benton Wagner, Ezra Solomon, Peter Norton, Newton Minow and other Encyclopaedia Britannica directors 1992

At Atari's Sunnyvale Research Laboratory, Kay consulted the next year on an encyclopedia research project sponsored by Atari, the National Science Foundation, and Hewlett-Packard. Joining Kay as a consultant on the prototype Encyclopedia Project was Charles Van Doren, recently retired from Encyclopædia Britannica.

Peter Norton Takes Britannica into the Software Business

Peter Norton

Although not willing to follow Wier's advice in 1983, Britannica's board of directors did believe the company needed to get closer to the emerging personal computer market. That year, Encyclopædia Britannica Educational Corporation, which I later served as president, published a dozen floppy disk educational titles that it had acquired for the Apple II platform. Soon Britannica decided to directly acquire its own software development capability. In 1985, it purchased Design Wear, EduWear, and Blue Chip, three small San Francisco- based software publishers also selling 5¼ inch floppy magnetic disk products.

With the introduction that year of the CD-ROM format, Britannica also began to think about how it might exploit this new medium. The question was not a simple one. With its vast storage capacity, the *Encyclopædia Britannica* itself was thought to be too massive to be put on a CD-ROM, even with minimal indexing and a text- only format. Also, the entire business model of the company was still built on selling its flagship, multi-volume print work at a purchase price of $1,200 and up, depending on the binding. The direct selling sales culture that prevailed at Britannica was no more receptive to the idea of an inexpensive, electronic alternative to the print set than it had been when Patricia Wier first made her recommendation.

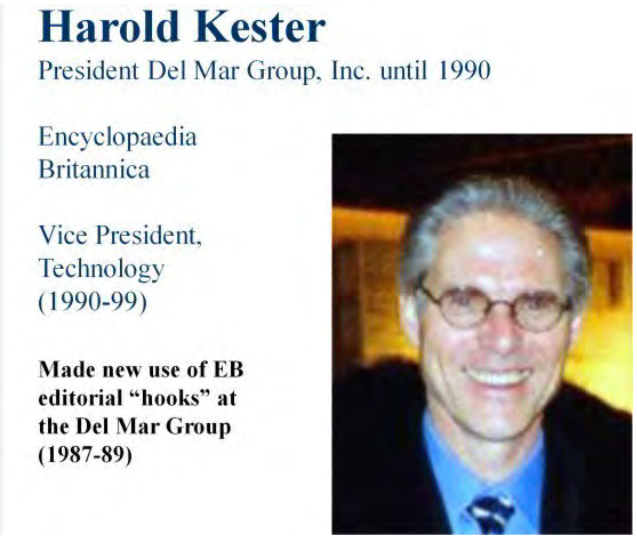
In 1987, Britannica's management, led by former Englishman, now American citizen, Peter Norton, hit on a solution.

Encyclopaedia Britannica Officers in 2000

Left to right: Bill Bowe, Executive Vice President, Secretary & General Counsel, Karl Steinberg, Vice President Human Resources, Robert Gwinn, Chairman, Peter Norton, President, Fred Figge, Chief Financial Officer and Patricia Wier, EB USA President

This time the plan was not seen as a threat to the sales force and it was endorsed by the board of directors. Instead of putting the *Encyclopædia Britannica* on a CD-ROM, Britannica would become a leader in the newly developing software publishing industry by building a multi-media CD-ROM version of its student- oriented *Compton's Encyclopedia*. At the time, the Compton's print set was given away free as a premium to purchasers of the more expensive Encyclopædia Britannica print set.

Harold Kester, SmarTrieve, and Compton's Encyclopedia



Harold Kester

After further analyzing the potential market for such a work, Stanley Frank,in charge of development by then, decided in 1988 to partner in its development with Education Systems Corporation of San Diego, California. ESC had expertise in software development through building networked educational products for the school market. ESC chose as its text search engine subcontractor, the Del Mar Group. Del Mar was a Solana Beach, California, venture capital startup, with funding from Japanese computer maker Fujitsu.

Del Mar's chief scientist, Harold Kester, had already been building CD- ROM reference publications, though not for the consumer market. Importantly, Kester was also a student of the work of Gerald Salton at Cornell University. Salton had been doing pioneering research into the mathematical principles underlying automatic text retrieval. As Greg Bestik, ESC's head of development, Kester, and Britannica's editors and software engineers got together to plan the design of what became Compton's Multimedia Encyclopedia, they had one clear instruction from Britannica's management: Britannica was ready to invest millions of dollars in the product's development, but it must publish a revolutionary offering that would be a clear breakthrough in simplifying a user's interaction with computers.

This would not be a text-only product like Groliers. The depth of Britannica's vast holdings of reference media in film, pictures, animations, and sound would all be made available for close integration with the Compton's encyclopedic text. Kester's great contribution to this enterprise was to produce a natural language search engine that would help permit the prototypical nine-year-old to easily search the entire database for

articles of interest. Instead of expecting a nine-year- old to master the intricacies of Boolean logic in constructing search queries (“Sky” AND “Blue”), Britannica’s nine-year-old needed only to type in the search box “Why is the sky blue?” That would be enough to for Del Mar’s “SmarTriev” search engine to take the user to the answer.

Harold Kester, Vice President, Technology & Jorge Cauz, President
Seoul, South Korea 1998

Shortly after Del Mar’s organization in 1984, it became one of the first CD-ROM publishers the next year. It published the fifth CD-ROM in the United States in 1985. It was a prototype of a product intended for bookstores that would permit consumers to interact with a database and be guided to titles of interest. Its SmarTriev search system was licensed to other CD-ROM developers, and, in 1986, Del Mar briefly had the largest installed base of CD-ROMs in the country.

Informed by Gerald Salton’s earlier work, SmarTriev’s natural language search and retrieval system went far beyond the usual database search engines of its day.

Duly impressed, Britannica purchased SmarTriev and hired Kester and his team as soon as the networked version of Compton’s product was complete.

When Britannica and ESC signed their co-development agreement in April 1988, the Del Mar Group dived in to help with the preparation of the design document. This was completed in July 1988. It set forth in elaborate detail the architecture of the *Compton’s Multimedia Encyclopedia* that would be published in the new CD- ROM format in the fall of the following year.

The design document was very much a collaborative one. ESC had talented computer programmers and educational experts in San Diego and Austin, Texas sites. Harold Kester and his search engine group worked from Solana Beach, California, and the

Britannica editors and software experts were in Chicago and San Francisco. Over the years when I visited this brilliant group in Solana Beach and La Jolla, I had a chance to observe at close hand the intellectual leadership and creative genius with which Harold led his team. He was truly a person made for his time.

During development, between 40 and 80 individuals were active at any given time in working to bring the design document to life as a fully functioning product. This would be no prototype or demonstration vehicle for show and tell at a futurists' conference. They were about inventing and building the real thing.

If they succeeded, it would be proven that Ted Nelson's Xanadu dream could come true. Something along the lines of what Ted Nelson had surmised could actually be reduced to practice and change the world forever.

Those on the design team with a background in educational psychology were particularly sensitive to the fact that children learned in different ways. They pressed home the desirability of having different ways, both textual and graphical, for users to access the same information.

Dr. Stanley Frank, Vice President, Development

Stanley Frank

Thus, from the beginning, the novel idea of developing an architecture based upon multiple search paths to related information was central to the product. Also fundamental to the design were reciprocal hyperlinks between related data contained in other search paths. With a product that was easy to use and that could easily facilitate different styles

of learning, the group felt they were building a blockbuster, both for the network market within schools, as well as for the stand- alone consumer market.

This combination of ESC's computer networking programing expertise together with Britannica's skilled encyclopedists was a unique combination for the times. And building an electronic database that went beyond text to include sound, animation, video and maps, could never have been accomplished without the millions of dollars that was

invested by Britannica both before and during the development of the Compton's Multimedia Encyclopedia product. This unusual combination of human resources, coupled with a subset of Britannica's rich editorial content, turned out to be the requirements for building the software needed to bring a highly complex digital work to life.

If anyone doubted the difficulty of pulling this task off, for a parallel they need only look at the decades long and costly failure of Ted Nelson's Xanadu effort. It had never been able to actually produce a useful product that actually worked.

1990 Demonstration of Compton's Multimedia Encyclopedia

In this video made on February 1, 1990, Dr. Stanley Frank of Encyclopaedia Britannica, Inc., demonstrates to educators across the country in a live satellite feed how text, sound, video and maps are accessed in the new Compton's Multimedia Encyclopedia CD-ROM.

Britannica released a network version for schools of *Compton's Multimedia Encyclopedia* in fall 1989 at a press conference at the New York Academy of Science.

The news media was out in force, recognizing the product as potentially noteworthy. Dr. Stanley Frank, who had overseen the development process as Vice President, Development, demonstrated the Compton's CD-ROM for a national television audience through a live presentation that reached the nation on ABC's Good Morning America television show.

The consumer version of Compton's CD-ROM was published shortly after in March 1990 at a price of $895. Compton's Multimedia Encyclopedia, on a single CD-ROM disc, contained an amazing 13 million words, 7,000 images and numerous movies, animations and sound clips.

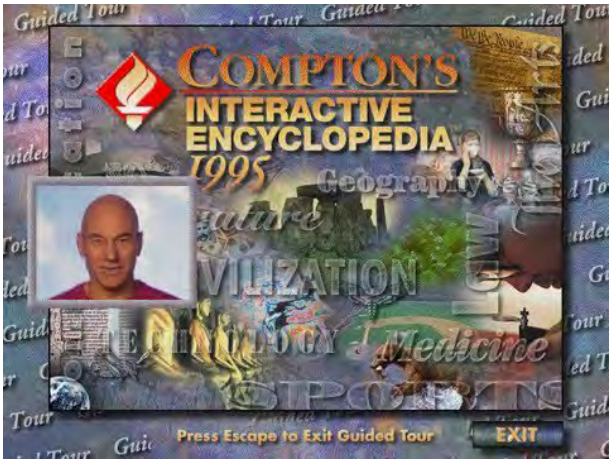
Compton's Multimedia Encyclopedia Makes a Splash

Compton's Multimedia Encyclopedia

The media again took notice. Said *Newsweek* of the breakthrough computer interface:

> Computers aren't just smart typewriters and zippy number crunchers anymore. . . Yet so far hype has outstripped hopes in the growing collection of multimedia programs. Like dazzling Hollywood flops, most have turned out to be long on technology, but short on substance. Until Compton's. . . Just getting that much information on a disc is impressive enough. Yet the beauty of Compton's is in the links – everything is woven together so the user can quickly move between related bits of information. Thanks to ingenious design, the program is so simple that, literally, a child can use it... Hit a difficult word? A click will bring up the definition – and if your PC has sound capability, the machine will even pronounce it for you. Whetted appetites: A staff of 80 writers, editors, designers and programmers worked for two years to bring the product to market.

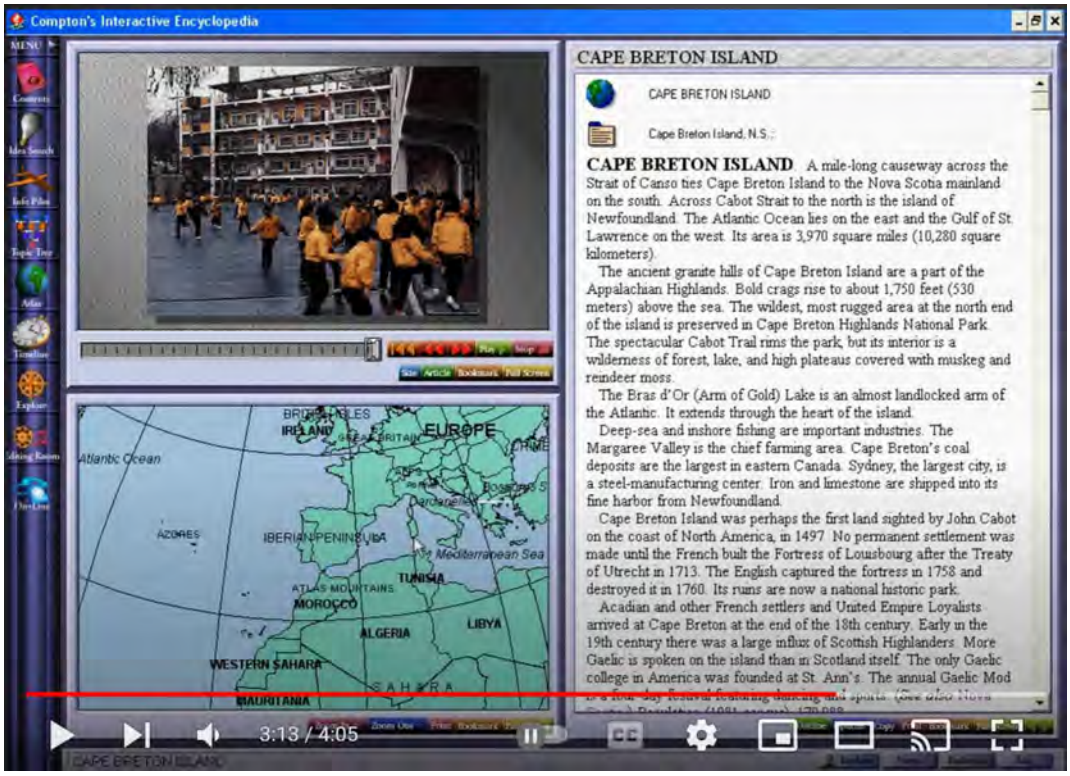
The effect on people experiencing Compton's for the first time could be stunning. Former Vice President Walter Mondale, like his political patron saint Hubert Humphrey before him, served on the Encyclopædia Britannica board of directors. Shortly after the Compton's product was released, I escorted Mondale to see the newly developed product with other directors at the Oak Brook Shopping Mall outside Chicago. He read with interest his own biographical entry reflecting his service as Vice President. After looking with less interest at the text of the entry on Richard Nixon, he got up from the keyboard and turned to leave.



Patrick Stewart Introduces
Compton's Interactive Encyclopedia 1995

Seeing he had ignored the sound button on the entry, I quickly clicked on the audio icon in the Nixon article. When the computer speakers boomed Nixon's disembodied voice ("Well, I'm not a crook!"), Mondale turned around, frozen in amazement. He was obviously not prepared for this Nixon redux and was stunned by the product coming to life this way.

Computer hardware manufacturers quickly saw Compton's could help sell their boxes to consumers. Tandy Corporation immediately struck a deal with Britannica to sell its new multimedia PC for $4,500, with the $895 Compton's disc thrown in for free. IBM, not wishing to be left behind, quickly gave Britannica a million dollars towards EB's continued development of the product, making sure it was adapted to IBM's newly planned multimedia computer entry.



[Guided Tour of the 1996 Compton's Interactive Encyclopedia]

This later video provided a guided tour as to how to navigate the text, video, sound, picture and dictionary elements of the more visually interesting 1996 Windows version of what was then named Compton's Interactive Encyclopedia.

Compton's Patent R.I.P. – An Afterthought

When the Patent Office reversed course in 1994 and withdrew the patent it had issued just the year before, Britannica challenged the action and brought suit. Years later, a federal district court in Washington, D.C. found the Patent Office in error and confirmed that no invalidating prior art had preceded the Britannica invention. The result was that in 2002 the Patent Office again issued the Compton's Patent. Finally, 13 years after filing its original patent application, Britannica could finally begin to try to monetize its invention.

By this time though, the technology associated with the patent had rapidly evolved. When Britannica approached non-encyclopedia companies asking them to license the patent, they declined to acknowledge the patent's validity, notwithstanding it prior validation after two lengthy investigations by the Patent Office. In response, Britannica brought another lawsuit asserting its rights against some of the infringers. In this subsequent litigation, again no dispositive prior art was ever presented showing that the

invention had been made by anyone else before the Compton's Patent application was filed in 1989.

As could be expected, attorneys for one of these parties being sued for infringement began wading through the already complex patent history. Lo and behold, they found a useful needle in the haystack. They discovered years after the mistake could have been cured that the Washington, D.C. law firm Britannica had hired to draft and file the patent application in the Patent Office had dropped the first page of one of the Xerox copies of the patent application it had filed. It had also made a scrivener's error by dropping a routine boilerplate phrase required to be recited in the application.

Dropping the page in a copying error and failing to put in the usual technical language required by the patent statute was bad news for Britannica. The result was that in 2009 the Compton's Patent was ruled invalid for technical reasons having nothing to do with the substance, novelty or importance of the invention itself.

But for the law firm's lapse, it appeared that the invention would have otherwise gone on to produce substantial royalties. By making public the details of the invention in its 1989 patent application it had been possible for other companies to quickly digest the nature of the invention and incorporate it into their own products. The application's detailed drawings and the textual descriptions of the innards of the invention gave rise to the immediate and wide dissemination of exactly how to structure and write the complex software needed to permit simultaneous access to multiple and disparate databases of text, sound, images and videos.

The only good news in this case's outcome for Britannica was that it had inadvertently cemented a perfectly good malpractice claim against the law firm that had negligently botched its job.

In the course of proving a case of legal malpractice involving a patent, the party alleging malpractice must show that a lawyer's mistake actually damaged it. If you're defending against such a claim of malpractice, you can get yourself off the hook if you can show that the patent in question was invalid and never should have been issued.

Therefore, when Britannica sued the law firm for legal malpractice, there was what's known as "the case within the case." This meant that the outcome of Britannica's malpractice case would also finally bring a ruling on the underlying merits of its patent. If this turned out to be good news for EB, it would be bad news for the Washington law firm. If the damages it was ordered to pay exceeded its malpractice insurance, it might bankrupt the law firm and perhaps some of its partners.

However undesirable it was for Britannica to have to sue a Washington, D.C. law firm in a District of Columbia court, it was unavoidable. When the dust finally settled in 2015 on this final dispute involving the Compton's Patent, the federal district court hearing

the case ruled that the invention was not patentable. This meant that while legal malpractice may have occurred, Britannica couldn't have been damaged.

In arriving at this conclusion, the court took a fresh look at the basic requirements for a patent to issue. It set aside the fact that in two separate instances the Patent Office had never found or ever seriously considered whether the software patent in question constituted what's called "patentable subject matter." Everyone before had always thought that it was, as the U.S. Supreme Court had long before ruled that software inventions could be patented.

Under the U.S. Patent Act, for a patent to be valid, it must have the attributes of utility, novelty, nonobviousness, enablement and it must cover patentable subject matter. There was no fresh evidence presented to the court in the malpractice case that the Compton's patent didn't meet the tests of being useful, novel, and nonobvious. It also had clearly enabled others ordinarily skilled in the art to replicate the invention. However, the court decided that Britannica's patent failed the remaining requirement for a valid patent because the patent did not meet the court's definition of "patentable subject matter."

The court said that "abstract ideas" were not patentable under the longstanding rule that an idea itself is not patentable. It said that the Compton's patent claims were drawn to the abstract idea of collecting, recognizing, and storing data to be easily found and retrieved, and that this was an abstract concept and therefore not patent-eligible. In its ruling, the court put it this way:

A "database" is nothing more than an organized collection of information. Humans have been collecting and organizing information and storing it in printed form for thousands of years. Indeed, encyclopedias---described as a type of "database" in the specification---have existed for thousands of years. For just as long, humans have organized information so that it could be searched for and retrieved by users: For example, encyclopedias typically are organized in alphabetical order and are searchable using indexes, and articles generally contain cross-references to other articles on similar topics. These activities long predate the advent of computers. Such fundamental human activities are "abstract ideas…"

Thus it was that a quarter century after the Compton's patent application was filed in 1989, the last hope of Britannica profiting from its investment in the invention was extinguished.

Having hired the law firm that drafted the Compton's Patent application in 1989, I was present at the creation as it were. I had subsequently spent 15 years directing and supervising the torturous regulatory and judicial quagmire that ensued. As it turned out, I missed the third act of the Compton's Patent drama when Britannica's malpractice claim finally died in 2015. My absence from the finale was a function of my 2014 retirement at the age 72 after 28 years s Encyclopaedia Britannica's General Counsel.

Engaged in the chasing of the Compton's Patent holy grail for all those years, I have a few simple afterthoughts as to how it all went down.

I think the patent would never have gotten in trouble in the first place had not Dr. Stanley Frank overreached in pursuing his dreams of a quick payoff. In the 2005 book *Intellectual Property Rights in Frontier Industries - Software and Biotechnology* edited by Robert W. Hahn, authors Stuart J. H.

Graham and David C. Mowery write that shortly after the Patent's issuance by the Patent Office in 1993:

Compton's president, Stanley Frank, suggested that the firm did not want to slow growth in the multimedia industry, but he did "want the public to recognize Compton's NewMedia as the pioneer in this industry, promote a standard that can be used by every developer, and be compensated for the investments we have made." Armed with this patent, Compton's traveled to Comdex, the computer industry trade show, to detail its licensing terms to competitors, which involved payment of a 1 percent royalty for a nonexclusive license. Compton's appearance at Comdex launched a political controversy that culminated in an unusual event—the U.S. Patent and Trademark Office reconsidered and invalidated the Compton's patent. On December 17, 1993, the USPTO ordered an internal reexamination of Compton's patent because, in the words of Commissioner Lehman, "this patent caused a great deal of angst in the industry." On March 28, 1994, the USPTO released a preliminary statement declaring that "[a]ll claims in Compton's multimedia patent issued in August 1993 have been rejected on the grounds that they lack 'novelty' or are obvious in view of prior art."

In the July 1994 issue of *Wired* magazine, the article *Patently Absurd* threw further light on how the Compton's Patent issuance created an almost instant political bonfire:

The Compton's patent contained 41 claims that broadly covered any multimedia database allowing users to simultaneously search for text, graphics, and sounds – basic features found in virtually every multimedia product on the market. The Patent Office granted the patent on August 31, 1993, but it went unnoticed until mid- November, when Compton's made the unusual move of announcing its patent at the computer industry's largest trade show, Comdex, along with a veiled threat to sue any multimedia publisher that wouldn't either sell its products through Compton's or pay Compton's royalties for a license to the patent. Compton's president, Stanley Frank, stated it smugly for the press: "We invented multimedia."

The denizens of the multimedia industry thought otherwise. In dozens of newspapers around the country, experts asserted that Compton's patent was clearly invalid, because the techniques that it described were widely used before the patent's October 26, 1989, filing date. Rob Lippincott, the president of the Multimedia Industry Association, called

the patent "a 41-count snow job." Even Commissioner Lehman thought that something was wrong.

"They went to a trade show and told everybody about it. They said they were going to sue everyone," says Lehman, who first learned of the Compton's patent from reading an article in the *San Jose Mercury News.* "I try not to be a bureaucrat," he adds. "The traditional bureaucratic response would be to stick your head in the mud and not pay attention to what anybody thinks." Instead, Lehman called up Gerald Goldberg, director of Group 2300 [in the Patent Office], to find out what had happened.

Like Lehman, Goldberg had learned about the Compton's patent from reading the article in the *Mercury News*. "We pulled the patent file and I took a look at it," recalls Goldberg. "I spoke with the examiner. We felt the examiner had done an adequate job." In this particular patent application, says Goldberg, the Compton's lawyer had included an extensive collection of prior art citations – none of which described exactly what the Compton's patent claimed to have invented. Without a piece of paper that proved that the invention on the Compton's application was not new, the examiner had no choice but to award Compton's the patent.

To cap things off Compton's New Media officers had also been quoted as saying offhandedly that the patent covered "anything on a chip." This clearly added even more fuel to the fire.

So, to me the biggest fly in the ointment was Frank's hubris. Frank's announced desire to be paid a 1% royalty on multimedia sales in the middle of the industry's biggest conference on the newly emerging technology was not just a political misstep, or overreaching, it was nuts.

Unfortunately, the consequent delay in enforcing the Compton's Patent brought about by Frank's misjudgment is what really killed the patent. The political blowup following Frank's Comdex declaration caused the Patent Office to promptly pull the patent. This caused a nine-year delay in Britannica being able to enforce what the Patent Office would again find to be a perfectly valid patent. At least one academic study has gone into the details of the Patent Office's questionable decision to reexamine the patent. *Patent Reexamination and the PTO: Compton's Patent Invalidated at the Commissioner's Request*, 14 J. Marshall J. Computer & Info. L. 379 (1996), by *Terri Suzette Hughes*. Further, the law firm's technical error that might have been caught and cured early on, ultimately led to invalidation of the patent in 2009. This gave way to a further six- year delay pending Britannica's malpractice case claims against its law firm being finally assessed and turned down by a court in 2015.

The delay was deadly because by 2015 software technology had dramatically advanced in the quarter century since the Compton's Patent application was originally filed. By 2015, everything that was astoundingly novel back in 1989 had not only become commonplace, but it was so old hat that it was not hard for the federal court involved to conclude that the invention was no big deal and merely "an abstract idea." Also, it was easy for people to surmise that a company founded in 1768 like Encyclopaedia Britannica, a stodgy reference publisher of multi- volume printed encyclopedias, was just not in the right company with the emerging technology giants of Silicon Valley. It was hardly a regular player in the high-tech patent field.

I think there was a good chance Compton's Patent could have had a normal commercial life had not the political uproar at its birth delayed its day in court to a point in time when a usually correctible technical error could no longer be fixed and the substantive patent law had evolved in the meantime to make software patents generally harder to come by.

To my eye, the malpractice court's conclusion may have saved a local law firm from having to pay for an egregious error, but the way it arrived at this conclusion gave short shrift to the unique contribution Encyclopaedia Britannica had made to the advancement to the human/computer interface.

If Stanley Frank is the fall guy for the story of a fundamental patent that lived and died several times over a quarter century, could there possibly be a hero anywhere in this found and lost tale?

Absolutely! Let Harold Kester be given his due. Harold more than any other single person was the true inventor of the breakthrough invention embodied in the Compton's Multimedia Encyclopedia. In the long history of the Compton's Patent litigation, neither the Patent Office nor anyone else successfully brought forward prior art that challenged the fact that the invention Harold Kester was central to creating was the very first of its kind. His Del Mar group had been hired by Britannica to provide a search engine for the unusual and novel CD-ROM Britannica was determined to develop and under Harold Kester's exceptional leadership they with ESC and Britannica's editors accomplished what they were asked to do.

When I first learned of the scope of the computer software undertaking being launched I travelled many times from Chicago to Solano Beach and La Jolla, California where Harold Kester's led the small team that worked on the search engine at the heart of the project. Having watched Harold at white boards leading his team through the analysis of the software's internal organization, I can personally say Harold the key genius that could put all the pieces together.

Harold was the mathematical genius who was able to couple the nascent science of computer search technology with the recent computer hardware advances. Though others were involved on the teams that put his ideas to work, Harold Kester was really the one who can be primarily thanked for the Compton's innovation.

In recalling this part of the development of the human/computer interface early in the Information Age, I was left wondering what the reaction would have been if Ted Nelson had been able to bring his Xanadu Project to fruition in the form of a similarly novel, functional, and valuable end product. Would people really have thought that the novelty and ingenuity of his hyperlinked product was nothing more than a display of a "fundamental human activity." Would it have been dismissed as a mere "abstract idea" that had already been floating around for thousands of years. Personally, I think not.

What do you think?