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[See table of contents](#)

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The Evolutionary Chain of Eight Forms of Language: Speech, Writing, Mathematics, Science, Computing, the Internet/World Wide Web, Search Engines and AI Applications

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I. Introduction

In this investigation I consider extending the hypotheses I developed in two of my former explorations of the evolution of language where I define a language as a system of both communication and a way to create and organize information. By the evolution of language, I am not focused on the way spoken languages evolved for example from Latin to the various romance languages in use today such as Spanish, Portuguese, Catalan, French, Italian and Romanian. Rather I am interested in the way speech evolved into writing and then with a notation for numbers into mathematics. And then how writing and mathematics evolved into science. And then from science how language evolved into computing, the Internet including the World Wide Web, search engines and artificial intelligence (AI). So that I arrived at my new hypothesis that there exists an evolutionary chain of eight languages consisting of: 1. speech, 2. writing, 3. mathematics, 4. science, 5. computing, 6. Internet/Web, 7. search engines and 8. Artificial Intelligence.

My study of the evolution of language is itself a form of evolution. It began in 1995 one year before the Internet/Web went public when I published a book entitled *The Fifth Language: Learning a Living in the Computer Age* (Logan 1995) in which I suggested that speech, writing, mathematics science and computing formed an evolutionary chain of languages. As a result of the incredible impact of the Internet and the Web five years later in 2000 I updated *The Fifth Language* with a book entitled *The Sixth Language: Learning a Living in the Internet Age* that subsequently appeared as a second edition in 2004 (Logan 2004b) where I added the Internet and the Web to my original five languages and suggested that speech, writing, mathematics, science, computing and the Internet/Web represented an evolutionary chain of six languages. Then In 2005 in an article published in *Semiotica* (Logan 2005) entitled "Making Sense of the Visual – Is Google the Seventh Language?" I toyed with the notion of adding Google and search engines in general as the seventh language in the evolutionary chain of languages because of the way in which they make the access of so much of human knowledge and achievements available to any person with a computer, access to the Internet and a search engine like Google. Other projects got in the way of this project such as my exploration of the impacts of AI: Braga and Logan (2017; 2018; 2020 & 2021); Logan (2017). I never returned to my notion of Google as the seventh language. I do so now and have added AI as the 8th language.

AI has made major advances since my 2005 paper especially most recently with the emergence of the AI chatbot, ChatGPT in November 2022 and Google Bard more recently. These developments got me thinking of my original idea of the evolution of languages and I have therefore decided to explore and probe in the spirit of Marshall McLuhan's notion of a probe, the idea that the evolution of languages now can be extended from the original six in my book *The Sixth Language* to include search engines like Google as the seventh language as I proposed in my *Semiotica* article in 2005 and AI applications like the chatbot ChatGPT and Google Bard as the eighth language. I am well aware that today's search engines like Google are a form of AI but given that the level of sophistication of the generation of AI apps so far surpasses that of search engines I prefer to regard AI and search engines as separate languages. While it is the case that today's search engines like Google make use of AI, the very first search engines did not make use of AI and I therefore feel that regarding search engine and AI as

separate languages is justified. One could also argue that writing and especially the alphabet or other forms of writing are a form of AI also in the way in which they facilitate locating information in a dictionary or an encyclopedia. Wikipedia is another form of AI as it is a tool that allows one to access much of human knowledge and information. I will leave these musings for a separate article and stay focused here on the evolution of the eight forms of language.

The notion that speech, writing, mathematics, science, computing, the Internet-World Wide Web, search engines and AI form an evolutionary chain of eight languages is explored as a hypothesis that might provide some insights into the relationship of these eight forms of language. But first let me explain why I consider these eight candidates as languages. I am defining a language as a mode of communication, as well as the creation, exploration and organization of information and knowledge. A language is a system of signs for organizing, creating and communicating information. Each of the eight languages that I am considering to be part of an evolutionary chain of languages has its own unique vocabulary and syntax. There are many overlaps of the elements of these eight forms of language in terms of vocabulary and syntax but there are unique elements in each of these eight languages that are not present in the other languages. Spoken language for example has grammatical structures not found in written language and vice-versa. There are unique grammatical structures in mathematics not found in the other seven languages. The vocabulary of words in scientific language might have the same pronunciation and spelling as words in spoken and written language but they frequently have slightly nuanced meanings different than that found in non-scientific spoken and written language. For example, speed, denoted by a single numerical value, and velocity, denoted by a vector in scientific discourse are quite different but often have the same meaning in every day spoken and written non-scientific language.

This article is not presented as my final take on the relationship of these eight languages and modes of organization but it is a start of an inquiry into my intuition that these eight modes of language are interrelated and represent an evolutionary chain of tools for the creation, organization and communication of information and knowledge. As such I welcome comments and criticisms of my probe which can be sent to me using my email address above.

II. Definitions of Language, Data, Information, Knowledge, Wisdom, Intelligence and Artificial Intelligence

Since language is interconnected with data, information, knowledge, wisdom, intelligence and Artificial Intelligence we define these terms in this section and discuss how they are interconnected. Given the interconnectedness of these terms their definitions are somewhat circular.

- Language is a system of signs, acoustic, visual, or digital used for the transmission, communication, formulation and representation of data, information, knowledge, and wisdom. Language is also a form of and a sign of intelligence.
- Data are the pure and simple facts without any particular structure or organization, the basic atoms of information (Logan and Stokes 2004).
- Information is structured data, which adds more meaning to the data and gives them greater context and significance (ibid.).
- Knowledge is the ability to use information strategically to achieve one's objectives (ibid.).

- Wisdom is the capacity to choose objectives consistent with one's values and within a larger social context (ibid.).
- Intelligence is the ability to use language to deal with data, information, knowledge and wisdom. {There are many definitions of intelligence in addition to the one presented here with our bias towards language. For a compilation of the many different definitions of intelligence see <https://www.calculemus.org/lect/08szt-intel/materialy/Definitions%20of%20Intelligence.html>, accessed July 17, 2023.}
- Artificial intelligence (AI) is the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans that require human intelligence and discernment. Although there are no AI applications that can perform the wide variety of tasks an ordinary human can do, some AIs can match and even exceed humans in specific tasks (<https://www.britannica.com/technology/artificial-intelligence>, accessed July 17, 2023). As with the definition of intelligence there are many definitions of AI.

III. McLuhan's The Medium is the Message and the Six Innovations that Emerged from 1964 to the Present

In the Introduction to *Understanding Media* McLuhan (1964) wrote:

The Medium Is the Message

In a culture like ours, long accustomed to splitting and dividing all things as a means of control, it is sometimes a bit of a shock to be reminded that, in operational and practical fact, the medium is the message. This is merely to say that the personal and social consequences of any medium—that is, of any **extension of ourselves**—result from the new scale that is introduced into our affairs by each **extension of ourselves**, or by any new technology.

When McLuhan wrote these thoughts in 1964, he was reflecting on the new scale of the technologies that emerged up to that point in his life that included telephone, radio, recorded music, motion pictures (silent movies then talkies), electric appliances, international telephony, television, mainframe and mini computers. His reflection on the new scale introduced into our affairs by these technologies/media led him to introduce the notion of the Global Village and the ideas that led to the formulation of media ecology. He realized that this was only the beginning of the radical transformation of the relationship of humanity and their technology which he also expressed in his ground breaking 1964 book *Understanding Media* when he wrote:

Physiologically, man in the normal use of technology (or his variously extended body) is perpetually modified by it and in turn finds ever new ways of modifying his technology. Man becomes, as it were, the sex organs of the machine world, as the bee of the plant world, enabling it to fecundate and to evolve ever new forms. The machine world reciprocates man's love by expediting his wishes and desires, namely, in providing him with wealth (ibid.).

In a certain sense in this passage McLuhan was suggesting in 1964 that many more new forms of technology would soon emerge. He was correct. Here is a list of six new forms or classes of technology that have emerged since 1964 with the date they became accessible to the general public. Each of these developments were being researched and developed by technologists well before they became accessible to the non-technical general population but we use as the starting date, the date when they first went public and began to affect society as a whole. Never have so many new technologies become available in such a short period of time, 48 years from the release of the Altair personal computer in 1974 to that of ChatGPT in 2022.

1. **personal computers** (1974 Altair, 1976 Apple 1),
2. **Internet** (1996 when the public had their first access to the Net and the Web although primitive nets began to appear in the early 1960s),
3. **search engines** (with public access in 1996),
4. **social media** (which took off with the Internet but existed in the form of Arpanet and electronic bulletin board systems that were first main frame and then personal computers based but social media as we know it today began with the Internet going public in 1996),
5. **smart phones** (Blackberry in 2002 and iPhone in 2007) but preceded by PDAs (personal digital assistants; late 1990s),
6. **AI** beginning as early as 1943 with the work of McCulloch and Pitts {on a personal note I knew these two AI pioneers and spent time with them in Warren McCulloch's lab as a grad student at MIT circa 1964-65}. It is only recently that AI really took off and went mainstream with the likes of ChatGPT in 2022 and Bard in 2023.

Never before have so many innovations emerged in such a short time frame with the six listed above which emerged with public access in the half century between 1974 and 2023. Never before have so many had so much access to information and the tools to further refine and manipulate that information in the history of humankind.

IV. How McLuhan Hinted at or Described Some of the Six Innovations that Emerged between 1964 and 2023

Marshall McLuhan's description of the impacts of electric technology and media are legendary. In addition to that he also hinted at the way computer technology would continue to evolve and what effects they would have which were uncannily close to the way computer technology has in fact evolved. In this section we describe how he hinted at the six major innovation described in the previous section that emerged after 1964, the publication date of *Understanding Media* (McLuhan 1964).

He suggested based on his observation of the effects of main frame computers that our economy would increasingly become more dependent on information and information technology. As early as 1959 he wrote: "The production and the consumption of information... is the main business of our time (McLuhan 2005, 5)." That is certainly the case with today's economy world-wide.

In 1968 at a luncheon with executives of IBM McLuhan talked about the coming of personal computers as described by Arthur Porter, the Chair of Industrial Engineering who worked with McLuhan at the University of Toronto:

Mac Hillock, [an IBMer] arranged a lunch with half a dozen of IBM's divisional directors. Marshall got soon tuned up and was telling them about a computer for every home [i.e. the personal computer], no need to visit the grocery store [i.e. Amazon for example] ... Two of them said to me after lunch, "we have not heard of anything as crazy as that!" Marshall was talking about the personal computer a dozen years before they thought of it. Here was a professor of English more than a decade ahead of the technical people in computer evolution. He was thinking in terms of the user (Nevitt and McLuhan 1994, 29-30).

McLuhan seemed to hint at the coming of the Internet and the Web when in response to the question put to him "How is the computer affecting education?" in 1967, two full years before the development of the Arpanet, the forerunner of the Internet he opined:

The computer in education is in a very tentative state but it does represent basically speeded up access to information and when it is applied to the telephone (read packet switching over telephone lines) and to Xerox (read a printer) it permits access to the libraries of the world, almost immediately, without delay. And so, the immediate effect of the computer is to pull up the walls of the subjects and divisions of knowledge in favor of over-all field, total awareness—Gestalt (McLuhan 1967, 67).

Another hint of the Internet came earlier in 1962 when he wrote:

A computer as a research and communication instrument could enhance retrieval, obsolesce mass library organization, retrieve individual encyclopedic function and flip into a private line to speedily tailored data of a saleable kind (http://en.wikipedia.org/wiki/Marshall_McLuhan).

The retrieval of "individual encyclopedic function" as McLuhan suggested even hints at a foreshadowing of Wikipedia while the use of term "saleable data" can be interpreted as the way search engine companies generate revenue through advertisements associated with their searches.

One of the aspects of today's commerce that involves the shift from products to services is something that McLuhan hinted at when he wrote in 1970: "All the industries of our time are

service industries. With Xerox the book becomes a service industry. It ceases to be a package or a product (McLuhan 1970).” With this observation McLuhan seems too have anticipated how the book is not only available as a physical object of ink on paper but it can also be accessed as an e-book online as a service. With the Internet and the service of search engines, online encyclopedias like Wikipedia and various Web sites, information can be accessed without the need to visit a library and search through physical books and documents. One no longer needs to buy physical recordings of music or movies or software packages all of these are available as down loads from the Internet as a service.

McLuhan also foresaw during a TV interview in 1966, 30 years before the Internet went public just how products would become services when he suggested:

Instead of going out and buying a packaged book of which there have been five thousand copies printed, you will go to the **telephone**, describe your interests, your need, your problems, ...and they say it will be right over. And they at once **Xerox**, with the help of computers from libraries of the world, all the latest material just for you personally... They send you a package as a direct personal service. This is where we are heading under electronic information conditions. Products increasingly are becoming services (McLuhan 2005a, 101).

If you substitute “Internet/Web” for **telephone** and “send an electronic file” for **Xerox** the above remark made 30 years before the Internet and Web went public is a perfectly accurate description of today’s online reality.

Another astounding prediction of McLuhan’s according to his biographer Phillip Marchand (1989, 170) was that of the smart phone.

He told an audience in New York City shortly after the publication of *Understanding Media* that there might come a day when we would all have portable computers, about the size of a hearing aid, to help mesh our personal experiences with the experience of the great wired brain of the outer world.

It should be noted that a hearing aid in the mid-60’s when McLuhan made those remarks was not like today’s unobtrusive devices but approximately the same size as today’s smart phone.

McLuhan seems to have anticipated the e-book when he wrote in 1972, “When millions of volumes can be compressed in a matchbox it is not merely the book but the library that becomes portable (McLuhan 2005, 175).”

McLuhan anticipated what today we call product hacking and remixing. He suggested that hybridization releases energies and creates new forms:

“It is from such intensive hybrid exchange and strife of ideas and forms that the greatest social energies are released, and from which arise the greatest technologies (McLuhan 1964, 56).”

“The hybrid or the meeting of two media is a moment of truth and revelation from which new form is born (ibid., 63).”

The impact of the digital devices of the smart phone and the tablet, each a hybrid of different technologies that the digital format makes possible are perfect examples of the power of hybridization. The smart phone provides many services. It is a camera for recording and playing still and video images, a texting device, an Internet terminal, and also, a telephone for voice communication. Oh, by the way it also serves when needed as a flashlight and a mirror.

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