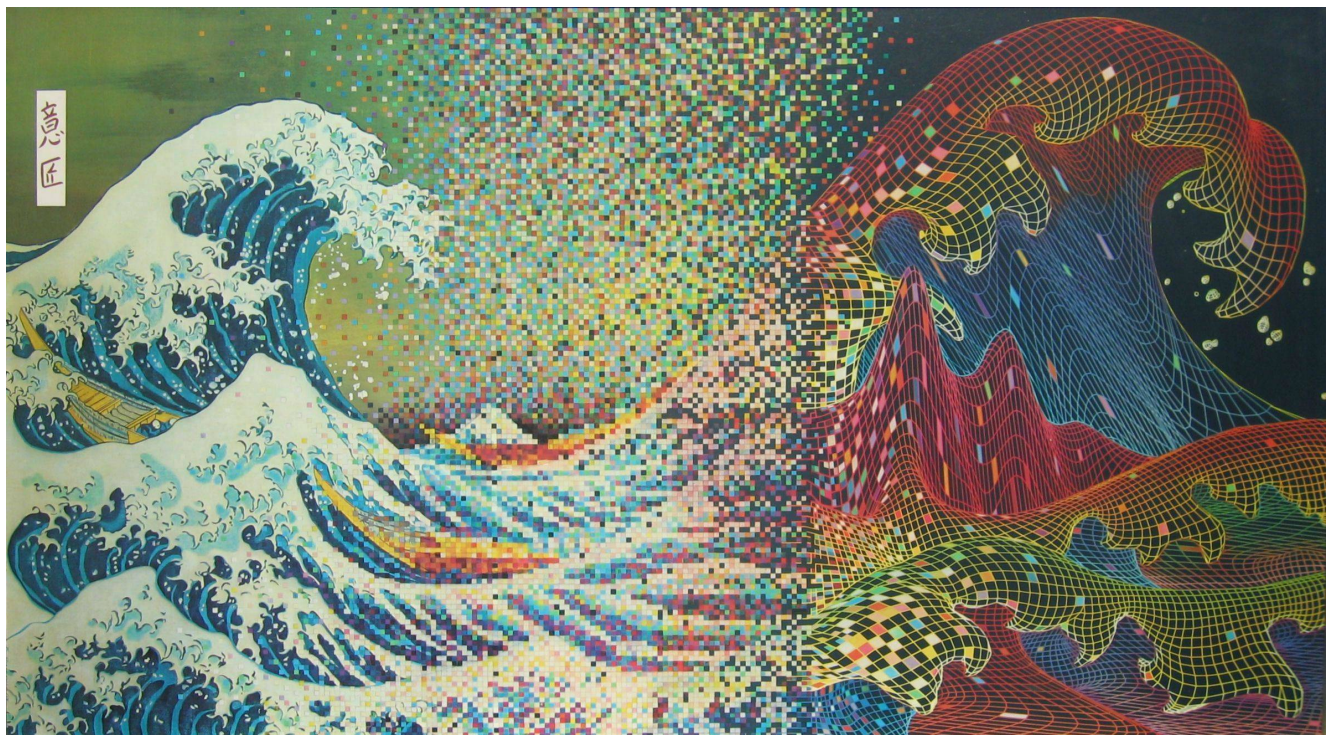


Imagining the Internet:

Explaining our Digital Transition



Judy Kirpich, [1981 for VM Software](#)

Brewster Kahle, with Frances Sawyer

the club

January 8, 2018

[Blog version](#)

Imagining the Internet: Explaining our Digital Transition

Brewster Kahle, with Frances Sawyer

the club, January 8, 2018

A digital wave is upon us, changing our lives, our occupations, our family relationships, our sense of what it is to be a person. The Internet, as a technology, is playing a large role, but what its impact is and what it will be is little understood. I have been looking at the images people have made of the Internet and the concepts and metaphors used to describe it in order to see how people communicate what is happening. Largely, I have been disappointed in what I have seen. I do not think we have the language to process what is happening in a way that facilitates critical thinking and productive debate. While the individual ways we have portrayed the Internet are often descriptive of what is happening at the moment, maybe taken as a whole, or as a trajectory of portrayals, we might be able to see where the digital wave could lead—or should lead.

There is productive feedback between engineering and the imagination. To the extent that we can shape the Internet, what should that shape be? We imagine a future to engineer it, yet the products of the engineering process in turn direct and expand our imagination of the possible. What will the Internet become? An automated library? An indexed set of images? Video telephone calls? An immersive game? All of these were possibilities and all have now been realized. As users were introduced to these services, some dominant metaphors emerged to explain the novel experience of being online. I suggest these images are useful to track over time as it gives us insight into our evolving understandings and desires.

To that end, this is a timeline of metaphors and images we have made for the Internet, an evolution of sorts. As with biological evolution, eras overlap, as there were mammals during the time of the dinosaurs.

As a tour through history of imaginings of the Internet it might help us understand where we are going, and more to the point, where we think we should go.

Personally, in 1980, I imagined an Internet eventually centered on the computer, but useful powerful computers. Working in an artificial intelligence laboratory led me to think that computers will be increasingly autonomous and interconnected. To bring up these computers—in a way like offspring—I thought we needed a large number of people to interact with them and teach them, so they could learn from us. This in turn required that

the machines be worthy of our attention. If we got there, there would be a merging of people, computers, and the library.

Those were the heady days of artificial intelligence, but the computers of the day were clunky accounting machines. So there were steps to go. A group of us built the fastest supercomputer of the mid-1980s to help build this vision of artificial intelligence, but even those computers could only hold dozens of digital books in their 32 megabytes of main memory. But this was a first step in teaching the computers by encoding books and newspapers. The goal was to have the machine search, find patterns, and make deductions by “reading” all books.

We wanted to bring the library to the computer, and the computer to the library. This longer vision was just that, an unrealized vision. Whether it will turn out to be correct, only time would tell. Thirty-five years have now passed and technology and society has evolved, but the future and the proposals for the future are still unfolding.

Before starting the tour, I would like to point out an artist’s vision that seems to have missed the mark: WAISStation I and II by Nam June Paik in 1994 which used the name of the Internet publishing system I invented, WAIS. The sculpture is shaped to mimic a broadcast tower, but one made out of televisions and computer parts. I do not think this represents the interactive, participatory aspect of WAIS or the early Web of the 1990s. The vision is too centralized in comparison to what we imagined. But, it is interesting to see how others mapped the last generation of technology onto the emerging technologies and how visions are often wrong. I am reminded that our future may be foretold, but it is not inevitable.



WAISStation II (left), Author next to Nam June Paik's WAISStation I (right) (1994).

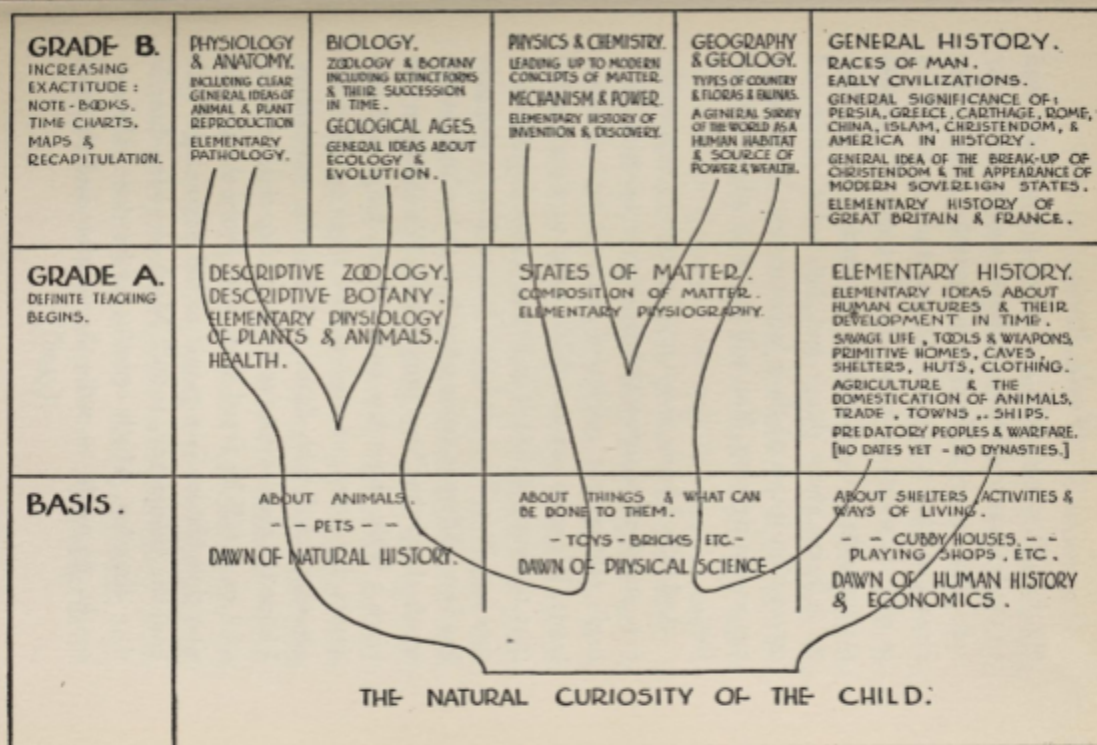
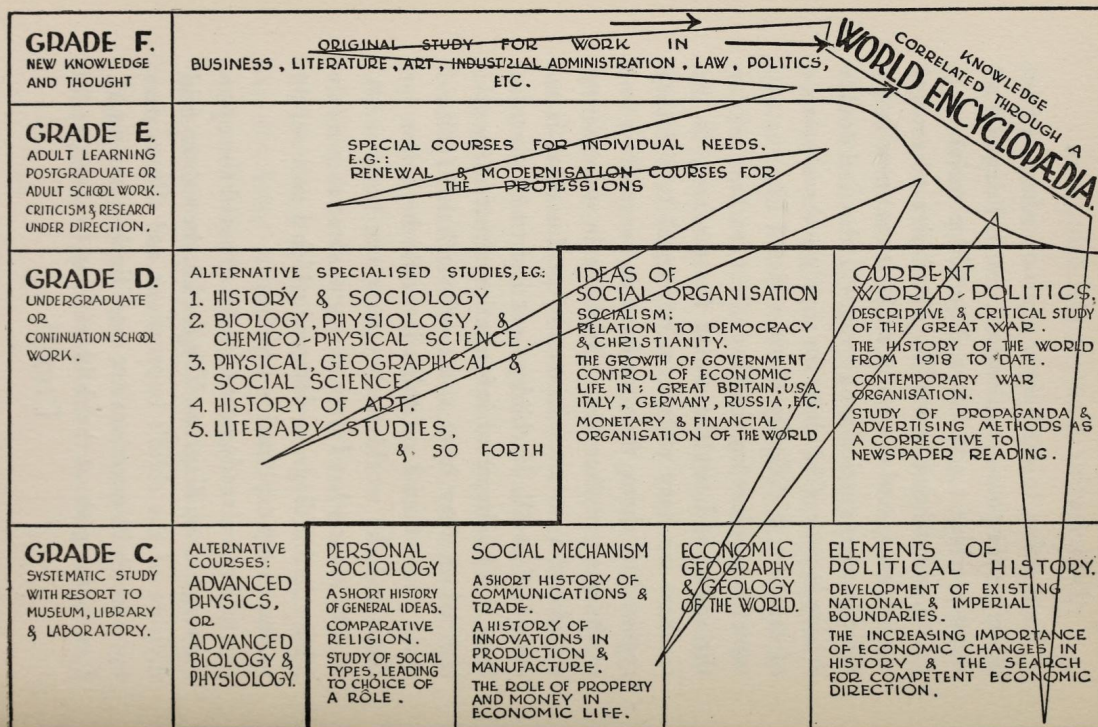


Cyclopaedia: or, An Universal Dictionary of Arts and Sciences. Ephraim Chambers (1728) on archive.org

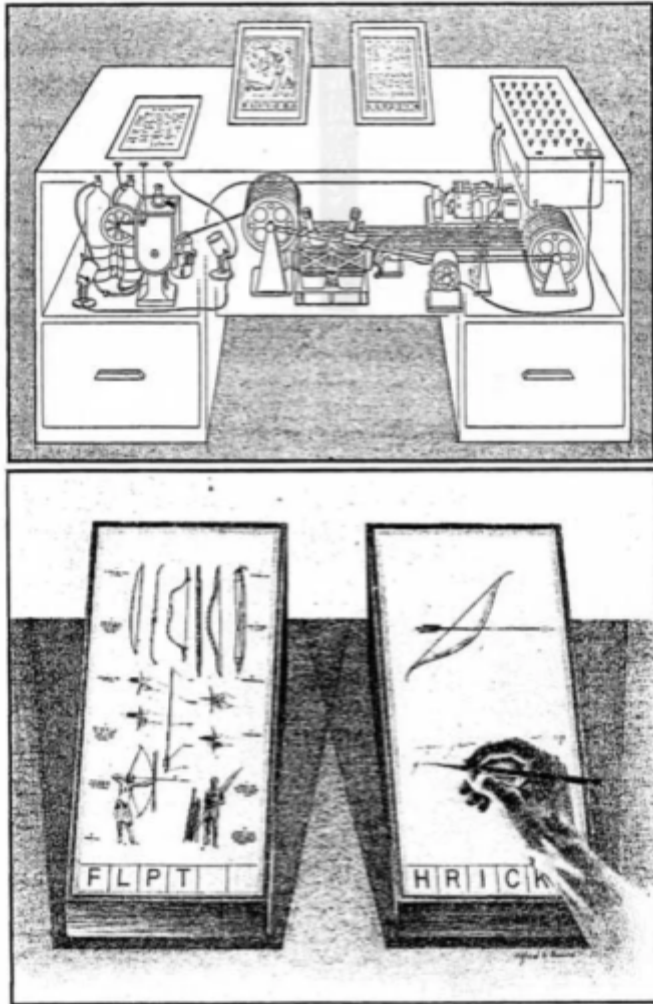
Internet as Library

An aspirational image of the Internet came long before the Internet was built: that of a 'Great Library.' The dream of a reference collection that would be searchable and where footnotes could be instantly followed to other works. This idea blossomed into hypertext, Wide Area Information Servers, and then into the World Wide Web.

H. G. Wells' collection of essays in [1936](#), [World Brain](#), noted that "the time is close at hand when any student, in any part of the world, will be able to sit with his projector in his own study at his or her convenience to examine any book, any document, in an exact replica."



A schematic of the knowledge held and nurtured in the World Brain (1936).



Memex from the *Atlantic* article (1945) by Vannevar Bush.

For H.G. Wells, the resulting “World Encyclopaedia” would serve a political goal. “It might act not merely as an assembly of fact and statement, but as an organ of adjustment and adjudication, a clearing house of misunderstandings; it would be deliberately a synthesis, and so act as a [test] and a filter for a very great quantity of human misapprehension. It would compel men to come to terms with one another.” Such a resource would be comprehensive and flexible enough to match individuals’ intellectual growth. It would foster and enable education from the creative wonder of childhood through the technical and social needs of adulthood.

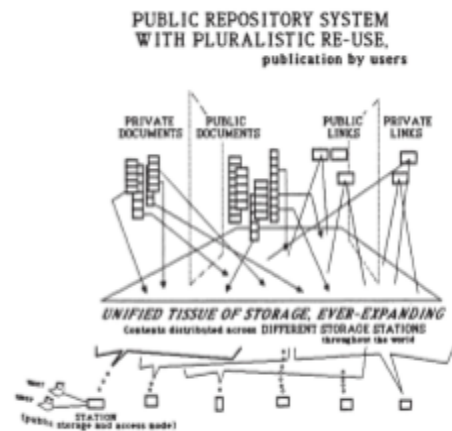
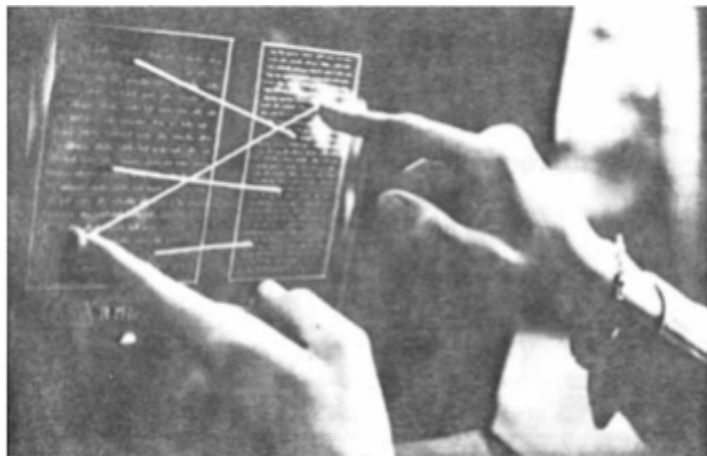
With such a comprehensive reference work, and the shared capacity to utilize it, humankind could realize the dream of World Peace, even as the political and economic engines of two world wars fast-tracked scientific progress in the name of industrial

warfare. Interestingly, 65 years later, Wikipedia (2001) would come a long way toward realizing this vision of an encyclopedia built on the idea that a crowdsourced consensus would emerge on every topic.

The architect behind the U.S. government’s military research program in World War II—most notably of the Manhattan Project—also articulated the coming of searchable, comprehensive, and affordable knowledge. In a [1945 paper in *The Atlantic*](#), [Vannevar Bush \(as appeared\)](#) describes the “Memex,” a desk-sized contraption that was based on indexed microfilm. In such a system, “the Encyclopaedia Britannica could be reduced to the volume of a matchbox” and “a library of a million volumes could be compressed into one end of a desk.” In addition to the alphabetic and chronological indexing of a

typical library, the Memex would enable associative indexing between documents through annotations and notes, thus better approximating the working of the mind. The Memex was not, however, connected to computing power or network concepts.¹ As a tool, it was analog.

The great library idea was primed to go digital. Ted Nelson in the 1960s picked up on the idea of interlinked texts that began with the idea of living footnotes that illustrate the history and interconnections of ideas within our written canon. These concepts were beautifully illustrated in [Literary Machines](#), as Nelson wove a narrative of the backend system that would support the future information networks he knew were coming.



Ted Nelson demonstrates Xanadu's hyperlink system (left) (1972). A schematic of storage from [Literary Machines](#) (1980).

His “[2020 Vision](#)” of 1980 predicted

“...there will be hundreds of thousands of file servers—machines storing and dishing out materials. And there will be hundreds of millions of simultaneous users, able to read from billions of stored documents, with trillions of links among them.

¹ [A later book](#) by Noah Wardrip-Fruin brought together many of these early imaginings of medium to come and was summarized in the introduction, Janet H. Murray: "The engineers draw upon cultural metaphors and analogies to express the magnitude of the change, the shape of the as yet unseen medium. The storytellers and theorists build imaginary landscapes of information, writing stories and essays that later become blueprints for actual systems... Gradually, the braided collaboration gives rise to an emergent form, a new medium of human expression."

All of this is manifest destiny. There is no point in arguing it; either you see it or you don't. Many readers will choke and fling down the book, only to have the thought gnaw gradually until they see its inevitability.

The system proposed in this book may or may not work technically on such a scale. But some system of this type will, and can bring a new Golden Age to the human mind.”

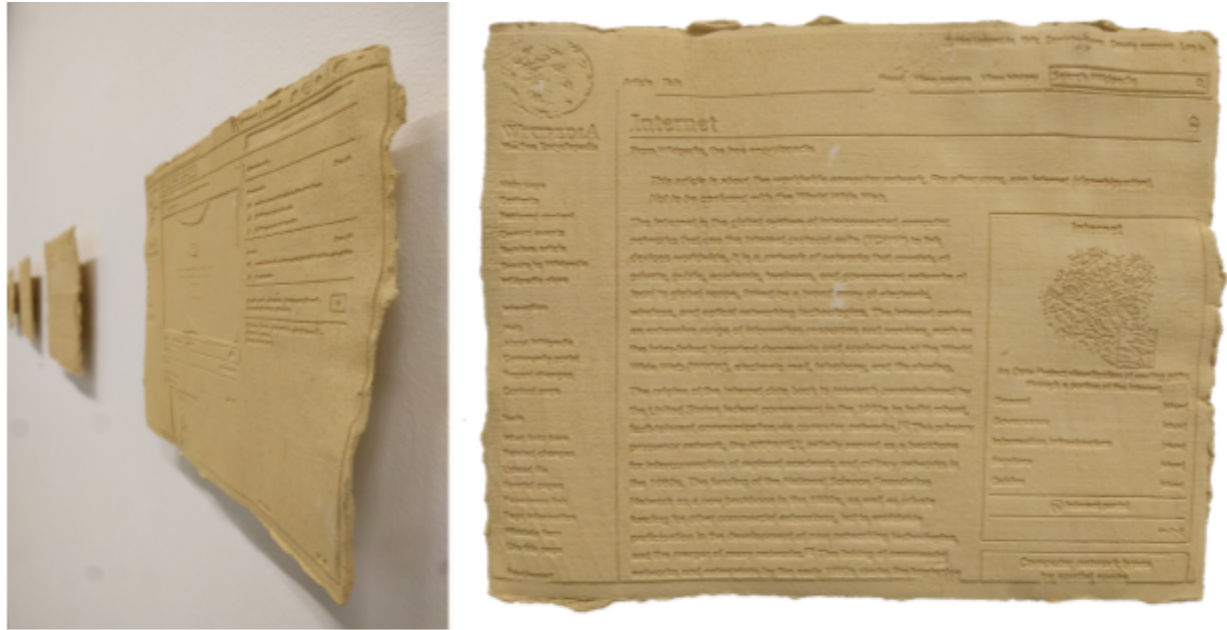
These images of a global interconnected library shaped the early Internet technologies of [WAIS](#) and the Web, even to the point where the inventor of the Web, Tim Berners-Lee called files of text “pages,” and leveraged some of the ideas of Ted Nelson’s hypertext in the development of links.

There have been many distinct projects to later realize this vision of a library on the Internet. The Google project, when at Stanford, started as a digital library project and was funded by the National Science Foundation’s Digital Libraries Initiative [in 1994](#).

In this context, the Internet Archive, founded in 1996, was built to be both the library of the Internet and the library on the Internet. Its mission—Universal Access to All Knowledge—embodies the long defended democratic ideal of the public library as made possible by the networked reach of the Internet which allows the Archive to serve as a local library for users with a browser anywhere. The symbol of the Internet Archive is the Greek parthenon, with its reference to the Greek/Egyptian Library of Alexandria.



As the Internet has been adopted as a primary reference source for users everywhere, as well as a primary publication platform, there has been a questioning of preservation of ‘born digital’ materials.



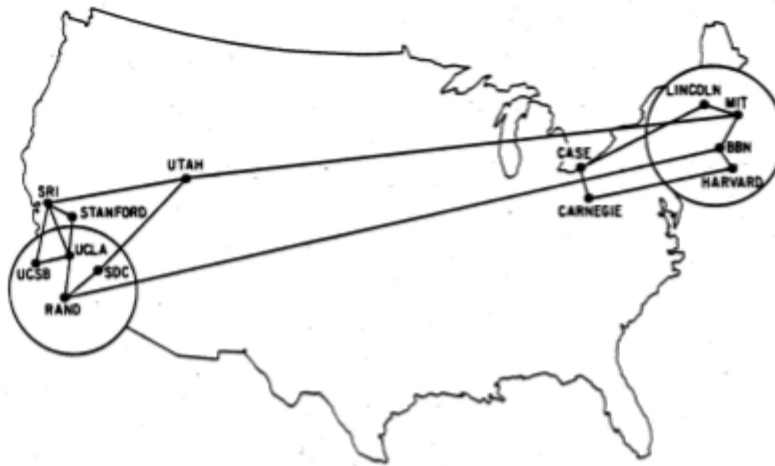
Clay tablets made by Internet Archive artist-in-residence Jeremiah Jenkins.

Internet Archive [artist in residence Jeremiah Jenkins](#) wrestled with this concept of digital permanence in his piece “Browser History” (2017). In this work, he cast web pages into clay to make “cuneiform web pages.” He has buried several copies in different deserts around California. He asked “how to preserve the internet for a very distant future? The oldest clay tablets have survived more than 5000 years.”

If the library metaphor was an aspiration of the information that would soon be available at our fingertips, the early imagined model of service delivery was more limited. It was static, desk-bound, caught in a single computer, or tied to a central, vetted repository. As the Internet developed, however, we began to see collective knowledge as more networked.

Portraying the Network

The ARPANet, the first network to implement the TCP/IP protocol, took “net,” derived from network, as its name. Early schematics illustrated the known nodes and the connections that bridged them. Because there were so few nodes, this was relatively simple. But it showed the new internet as a communications service connecting specific end users.

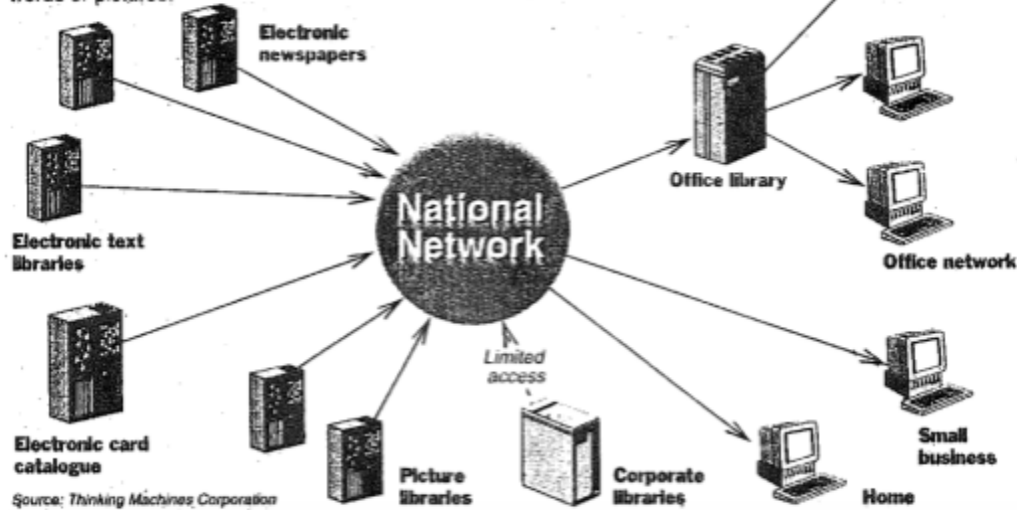


ARPANet (1971), connecting 13 Defense research institutions and Universities.

The network metaphor worked so long as all the nodes were known. But as more people joined and new services became available, the models of the Internet had to become more abstract. As the Internet started to be used outside of academia in the early 1990s, many images of the Internet were basic and functional, but helped bring a wider public to understand the technologies. Illustrations from the New York Times describing WAIS in 1991 show how multiple sources of information held at multiple points could be tapped through a national network. The network itself, however, was a black box.

Spreading Information

The Wide Area Information Servers system provides a broad range of information by linking users to many independent sources. The information can be in the form of sound, words or pictures.



New York Times article about WAIS (1991) illustrates how information held at multiple storage points could be accessed through a national network (Internet).

These services began to interact with one another in an ecosystem, and what took place within the national network began to be communicated. Writers, such as John Quarterman in his 1989 book [“The Matrix”](#), chose a matrix model for communicating the structure of the Internet. Others chose to list the services and demonstrate their relationships with simple arrows. Other diagrams grew to be cellular in their look, depicted on paper as colorful collages. [NSCA Mosaic](#), which provided unified access to a set of Internet services including Web, WAIS, Gopher, and FTP, earned its name as a literal mosaic of integrated services.



Maps of network services early 1990s.

² Photo links [left](#), [middle](#), [right](#).

As that ecosystem developed, both of networks and services, users began to experience a more integrated online world. But where was that experience taking place? As a 1994 network MCI commercial described, the Internet and its information “will not go from here to there. There will be no more there. We will all only be here.”



No More There (Anna Paquin Commercial from 1994)

MCI Network ad, "No More There," with Anna Paquin (1994).

But where was here? McLuhan predicted a “global village,” but in the early 1990s the Internet was being described as a mysterious space.



*Opte Project by Barrett Lyon (2003)
displayed at MoMA. Constellations of
Internet nodes. www.opte.org*

Internet as Cyberspace

“Cyberspace” is a metaphor for the Internet made popular in the early 1990s. This definition [from a 1993 proto-Wikipedia says](#) “The word ‘cyberspace’ was coined by the science fiction author William Gibson, when he sought a name to describe his vision of a global computer network, linking all people, machines and sources of information in the world, and through which one could move or ‘navigate’ as through a virtual space.”

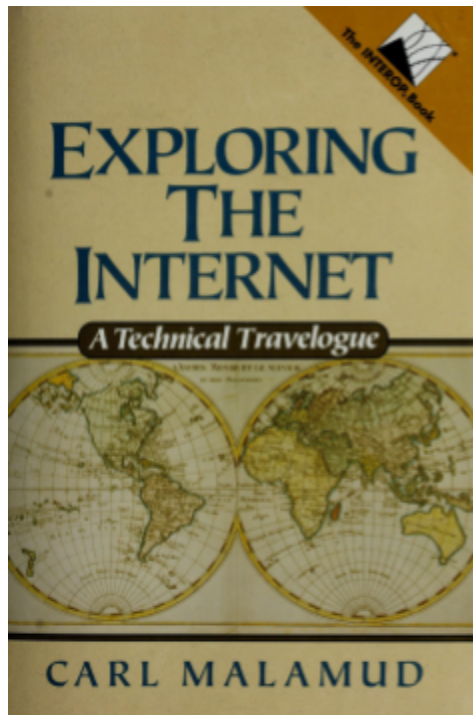
This captured the idea of a place or space, but of a different kind. Bruce Sterling [in 1992](#) described our first experiences of cyberspace as tied to the telephone. “Cyberspace is the ‘place’ where a telephone conversation appears to occur. Not inside your actual phone, the plastic device on your desk. Not inside the other person's phone, in some other city. _The_place_between_ the phones. The indefinite place _out_there_, where the two of you, human beings, actually meet and communicate.”

John Perry Barlow, [before 1992](#), said “Cyberspace is where your money is.”

This cyberspace was markedly different from the networked metaphor. The emphasis was no longer on the nodes, but on what happened between them. Cyberspace was distant, not of this world. It was big, star-studded, traced and defined by the movement of ideas and information.

Just as in the original 1960s Star Trek ventured into “Space, the final frontier,” cyberspace was to be explored by brave, cutting-edge adventurers who could log in.

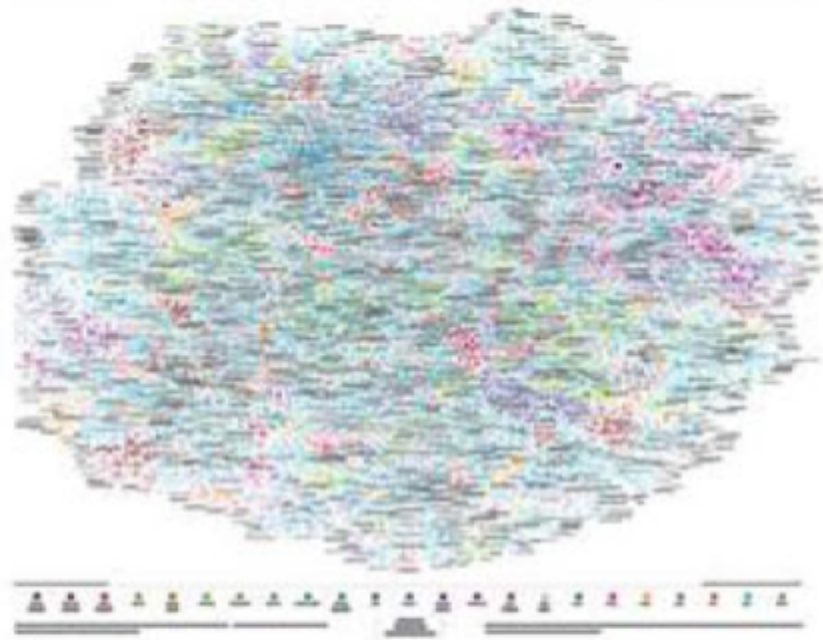
Carl Malamud wrote a book [in 1993](#) titled “Exploring the Internet: a Technical Travelogue.” The book was researched through interviews around the globe with the engineers and thinkers actively building the Internet. I am proud [to be in it](#). The book captured the sense of adventure inherent in discovering and building a new place.



The Internet was Explored and Navigated (1993, 1995, 12003)

After the first major Internet interface program, [NSCA Mosaic](#), came to be called a “browser,” the next browsers embodied this metaphor of exploration directly. Netscape Navigator’s logo (1995) placed the user at the helm of a ship steering among the stars. Microsoft’s Internet Explorer (1995) holds the ‘explorer’ word in its name, and Apple’s Safari (2003) also signifies adventure and has a logo of a compass.

THE INTERNET: 01.01.00



Peacock Map of the Internet (2000).

Cyberspace was increasingly populated with explorers, laypeople, and the now native hackers who viewed it as their primary intellectual home. In the 1996 [Declaration of the Independence of Cyberspace](#), again from John Perry Barlow, he warns “Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone.”

Made visual, there were many maps made of “Cyberspace” as the interconnections were visualized in artistic renderings. A swirl of relationships was colored and mapped, but unlike the early network schematics, the emphasis of these renderings was on the interstitial place between the nodes, the new virtual place where everything happened.

The peacock map posters became a staple of classroom and dorm walls. The earliest of these renderings, from 2000, is a visual not unlike the early universe just after the Big Bang. Matter is not yet organized. The 2003 Opte Project, digital artist Barrett Lyon’s open source project to visualize the metaphysical space of the Internet, shows the formation of large scale structure within the web as it expanded. The artwork was later featured at [MoMA](#).



Internet Archive's Webverse (2016) screenshot of the “galaxies” of cyberspace.

That structural formation was further depicted by the 2016 Internet Archive [Webverse](#) project, an interactive version of cyberspace rendered by Owen Cornec and Vinay Goel for the Archive's 20th anniversary. In this portrayal, the universe is made up of websites as stars, and the distance between the stars, was made by the number of interconnecting links. This visualization highlighted “galaxies” centered around Yahoo, or Facebook, or the somewhat separate constellations of Chinese and Russian websites. Cyberspace, and our understanding of it, has become vast but somewhat structured.

Settling the Electronic Frontier

At about the same time as the “cyberspace” image, there was a related, but interestingly different metaphor for the Internet as the “Frontier,” as located on land, albeit wild land. The Internet was now real estate, and we were homesteading it. The technical language of the components also changed. WAIS and FTP had “servers”, while the World Wide Web had “sites.”

The Electronic Frontier Foundation was founded [in 1990](#) to defend the civil liberties of those participating in, working on, and communicating in the new digital media landscape.

On the frontier, rules were being made by these new communities. Just as individuals had long trudged toward physical frontiers—from the Western United States to Australia and the Russian far east—to build a new life, to recreate their identity, to realize a utopia, or otherwise find fresh inspiration from the tradition-bound cloth of the old world, there was a mass migration to the Internet, provoking many experiments in governance.

Here there was a tension, always, between the utopians—the ‘open world’—who wanted to build a new form of community online, the resource capitalists who wanted control of the metaphorical real estate to support their businesses, and the less nimble governments. The frontier was where these actors interacted as the norms, law, and values of the Internet were first forged.

As example, ‘moderators’ of chat rooms imposed order on those within their ‘boards’ and ‘rooms’. Services evolved rules of behavior with takedown and other policies enforced by ‘admins.’

Anonymity added a key dimension to this sense of freedom, as individuals could choose an identity distinct from their day-to-day identity. They could choose more than one identity even, if they liked. Roles were fluid and experimental and, at first, separate from the flesh and blood person “IRL” (In Real Life). As a famous New Yorker cartoon [from 1993](#) put it: “On the Internet, nobody knows you’re a dog.”

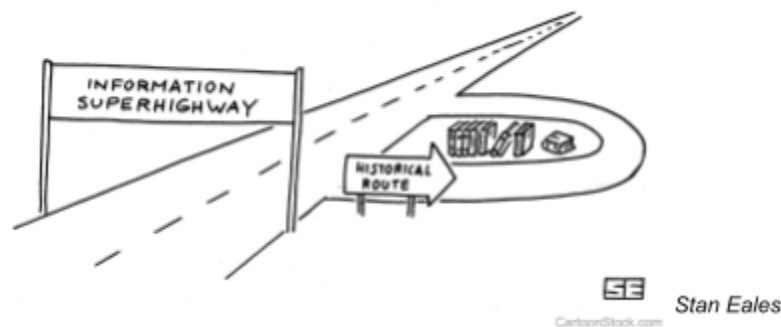


Peter Steiner cartoon,
New Yorker magazine (1993)

But as the frontier was populated, the real estate was fenced off and guarded. This process encouraged a remarkable amount of investment in the Internet, both from the private and public sectors.

As a landed metaphor for interconnection, Al Gore popularized the concept of an 'Information Superhighway' to encourage a network that was not privately owned as part of his legislative push for the High Performance Computing Act of 1991. In doing so, he codified what was to become another long-running metaphor for the Internet.

The superhighway would connect people and businesses through a virtual road system, open to carry any information for anyone. The language of highway infrastructure translated well in Washington, D.C., as governments were then comfortable with their role in financing and building basic infrastructure. This superhighway was never realized in whole due to intense lobbying by cable companies and other entrenched private interests.



This metaphor, as the Stan Eales³ cartoon depicts, shows how conception of the Internet had, for the moment, forgotten its roots as a digital library, with the curation and publications standards traditionally associated with print authorship and canonical

³ Cartoonist, Stan Eales replied to our inquiry, "In response to your question about how I came to draw the cartoon... well, I suppose I wanted to show that the internet has superseded traditional knowledge, just as a superhighway/motorway/ autobahn supersedes traditional, meandering roads. While the new route may take us places fast, the sheer speed of travel means that we will miss things along the way. Do we risk eroding critical thinking in favour of speed and quantity of information. But are we able to process all of the information coming at us? Is the internet too fast; built beyond the capacities of the human brain to assimilate and process information.

But, the cartoon can also be seen the opposite way. For those who wish to get off the superhighway, the traditional, old fashioned means of getting information are still available. Despite the domination of the internet, people still read books, they still go to the cinema, they still listen to the radio, they still have real sex rather than virtual sex. Despite the domination of fast food, people still make home-cooked food. There is room for everyone. Cinema didn't die once television was invented. The 'information superhighway' is just a tool. It's how you use it that counts. If you are a speed freak and depend on it from getting everywhere, then you risk losing out on some of the finer points in life."

knowledge. The types of information traveling along the superhighway would be a much broader swath of human experience.

The language of roads became increasingly useful in proposing the role for cable companies and Internet Service Providers in this new land. As their power consolidated, the metaphor has easily lead to conversations of possible “[speed limits](#),” “[tolls](#)” “[on and off ramps](#),” and “[fastslow lanes](#).”

With the metaphor of the Internet as real estate which could be settled, propertized, built upon, and fenced off, Larry Lessig coined the term “Creative Commons” [in 2001](#) to represent a form of open space, or park, for parts of our virtual world.



*A scholastic guide to the Internet
from 2000.*

Surfing the Web

“Surfing” the World Wide Web, a common expression by the mid-1990s, is not a landscape image but rather an expression of what it feels like to use the Internet. In [this](#)

[image](#)⁴, the Internet and World Wide Web were not places to explore, but rather a sport you played. The Internet was an activity, an experience.



The phrase was [derived from](#) ‘channel surfing’ on cable television, but by the [year 2000](#), use of the phrase to describe using the web overtook its television use.

A key attribute to this metaphor, however, is what it indicated about the ratio of reading and writing on the Internet for most people. Although publishing systems existed for non-technical users—the term “blog” entered the lexicon in 1997, LiveJournal was launched in 1999—the term surfing represented the average user as shredding sportily atop the information wave below, rather than contributing to that wave or living in the ocean. Authorship was still more formal, and most users were consumers rather than participants in the creation of knowledge or content. Moreover, surfing was not a continuous activity. Just like surfers on the California coast, users would surf the web, hang up their digital wetsuits, and return to everyday life.

But another digital wave was on its way that would significantly shift the way the Internet was imagined. As the Google Ngram viewer shows, the surfing metaphor peaked in 2004 just after the rapid rise of first Friendster, then MySpace and the founding of Facebook in 2004. As social networks became popular, the experience of being online was about to become immersive. New metaphors were needed, lest we drown.

⁴ A page of many images of “surfing the web”
<https://www.thehairpin.com/2011/02/people-literally-surfing-the-web/>

Google Books Ngram Viewer



Google Ngram Viewer is a useful tool to see the rise (and fall) of a particular phrase in the English canon. The tool searches all of Google Books published within a given timeframe, here from 1980-2008, and notes the frequency of a word or phrase printed during that time. Here the phrases “surfing the web”, “surf the web”, “web surfing” can be added to compare to the popularity of the term “channel surfing.”

The Facebook

In Star Trek, the Next Generation, a new alien being was introduced— “the borg.” The borg was made up of people augmented by technology that networked them into a single large being. This global brain was not a hero, but a villain. The borg worked as a collective hive-mind, augmented with ‘artificial intelligence.’ While separate beings, there was no individuality amongst the members of the borg. From the cradle, the borg’s young were always connected via implants glued to the side of their head. A famous line from the borg is ‘resistance is futile.’ The interconnected world could not be escaped.



The Borg from Star Trek (1989)



Cell phones, which became widely used in the 1990s, allowed people to stay connected. First they were connected with voice and text, and in the 2000s with pictures, video, the Internet, and social sites⁵. With the wide adoption of cell phones, the expected response time to a message shrunk considerably. In fact, for younger people the social expectation was that one had to be responsive immediately. To meet this expectation one had to stay connected. One had to be always on.

Furthermore, by moving to cell-phones the Internet services like Facebook were often no longer anonymous. Your real-world identity was now exposed and interconnected; reputations online and off were now tied.

⁵ The Apple iPhone was introduced in 2007, and by 2012 'smartphones' dominated more than 50% of the mobile phone market. With the iPhone came the rise of 'applications,' or more simply 'apps'. The Facebook was introduced [in 2004](#), mobile support came [in 2007](#), and a dedicated app [in 2008](#) with the launch of the Apple's App Store for iPhone.



Face sucker by Linda Jasmiina Vuorenvirta (2013) (left), and David Vallejo's illustration for a magazine piece, "Answer the Clue Phone" (2016).

Increasingly, people became “glued to their phones” as the apps incorporated news, camera, and chat functions and the phones became widespread.

It may be a stretch to relate Star Trek’s ‘borg’ and the rise of the always-on cell-phone Facebook feed, but the timing aligns. While introduced [in 1989](#), the ‘borg’ became, by TV guide’s 2013 user poll, the [4th favorite villain](#) - possibly reflecting a level of anxiety during that period of loss of identity through always-on interconnection.

As this always-connected reality became commonplace some artist’s depictions shifted from being negative and borg-like to becoming matter-of-fact. In *Sherlock* ([2011](#)) and *Nerve* ([2016](#)), talk bubbles and apps became visible parts of movies. The Internet, in these depictions, has come to surround us, to augment us.



Screenshots from Sherlock (2011) (left) and Nerve (2016) in which immersive virtual world is depicted on-screen.

As voice commands with our phones started with Siri in 2010, then [acquired by Apple](#) and now always-listening home assistants (Amazon's Alexa in 2014, and Google's Home in 2016), people are interacting with the Internet in more intimate ways. Movie depictions of assistant robots such as Real Human (original [Swedish version](#) 2012) are coming to be more day-to-day than the threatening "others" of Blade Runner (1982/2017) or Westworld (1973/2016).

Algorithms

In the 2000s, the Internet services developed into "platforms" such as Facebook ([2004](#)), YouTube ([2005](#)), Instagram ([2010](#)), Twitter ([2006](#)) that were multifaceted digital environments optimized by algorithms designed to hook users through individually tailored content. Now, some fear these algorithms are running us—telling us what to do, what to think, who to vote for.



A screenshot from EPIC 2014.

A brilliant video [from 2004](#) predicted the rise of algorithms in creating personalized information 'bubbles' in a fictional future system [called EPIC](#) that, by 2014, has taken over the media landscape. It is worth quoting at length:

"EPIC produces a custom content package for each user using his choices, his consumption habits, his interests, his demographics, his social network, to shape the product.

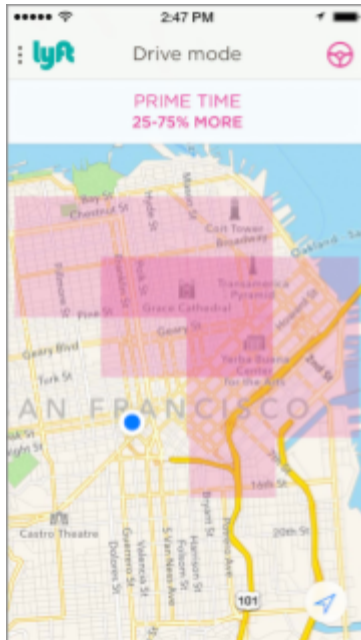
A new generation of freelance editors has sprung up. People who sell their ability to connect, filter, and prioritize the contents of EPIC. We all subscribe to many editors. EPIC allows us to mix and match their choices however we like.

At its best, edited for the savviest readers, EPIC is a summary of the world deeper, broader, and more nuanced than anything ever available before.

But at its worst, and for too many, EPIC is merely a collection of trivia, much of it untrue, all of it narrow, shallow, and sensational. But EPIC is what we wanted. It is what we chose. And its commercial success preempted any discussions of media and democracy, or journalistic ethics.”

This video, as a piece of art, utilized newsreel-style matter-of-factness to describe one potential future that viewers in 2018 may find eerily familiar. As traditional journalism was swamped by a wave of free, or seemingly free, content from blogs—often less well researched, more opinion-driven, and less guided by journalistic ethics—the way consumers got news shifted markedly. The U.S. presidential election of 2016 supercharged this conversation as fake news, hyper-targeted ad buys, and big data analytics were applied to selling candidates and stories. While this prescient video from 2004 could have informed the evolution of technology, I fear it did not in this case. The video itself has not been widely cited since its introduction in 2004.

The power of algorithms to control us is featured prominently in the previously mentioned movie *Nerve* (2016). In it, teenagers are lead by their phone apps into dangerous situations. The interesting twist in this depiction is the phone apps are completely driven by other users and crowd-written software algorithms. In such a world, who can be held responsible? The individual is hostage to the whim of the crowd. We, the collective, are the ones driving this based on a mixture of technology, networks, and anonymity.



Lyft (2014). Gamification of work.

Feeling “gamed” is spreading. Uber and Lyft have automated surge pricing when their analytics identify a supply and demand imbalance in a particular area. When a threshold is tripped, their programs automatically incentivize drivers to go to certain areas or drive at certain times of day. These algorithms force their drivers into characters in the form of a game. I asked a driver, point blank, as he talked about getting some reward for working an extra hour, if he felt ‘gamed’ or ‘played.’

He answered, ‘absolutely.’

Consciousness of being surveilled by companies and governments is growing, sometimes to improve the “user experience” and sometimes to control a population. This growth of mass surveillance was not always obvious. [In 1985](#), David Byrne sang “In the future there will be so much going on that no one will be able to keep track of it.” He was right that no *person* could keep track of it, but machines can, and increasingly are, keeping track. Building a profile of billions of people is not a difficult task at this point for companies or [governments](#).

Rendering the effects and possibilities of Big Data and algorithmic “deep learning” in artworks and language that most people can understand is in early stages of evolution.

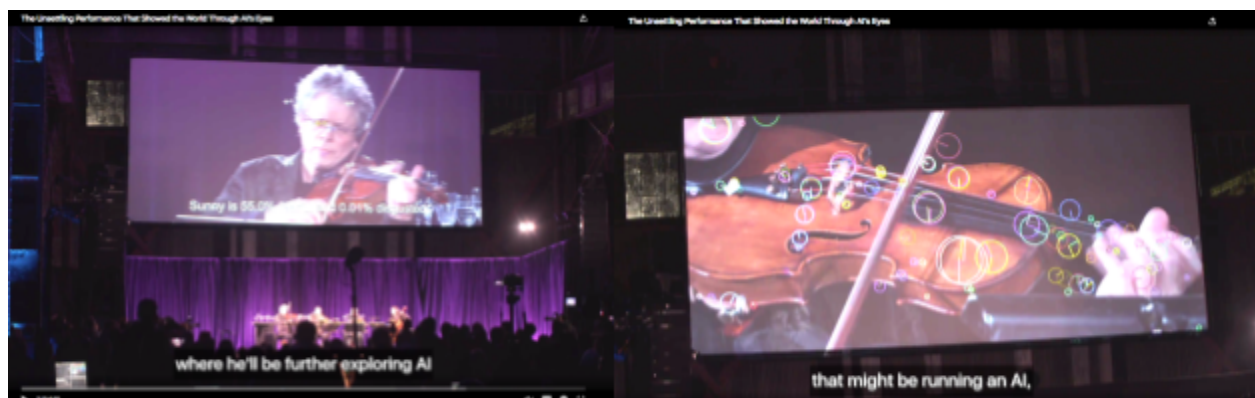
Machines Viewing Us

Where is this going? What can we say about what comes next?

Trends that are emerging include decentralized systems such as bitcoin and the [decentralized web](#), immersive virtual reality games, and augmented reality. Creative imaginings are starting to emerge.

One of these emerging trends that I would like to highlight is the switch from imagining what the Internet looks like to people, to how people look to the emergent machines.

In this depiction, the Internet is not being explored by us, not being controlled or surfed by us, or even controlling us, but rather the machines, that make up the Internet, exist on their own and learn from the world. This is a view that while the Internet needed us to bring it up, it will soon not need us, and will, in fact, outgrow us.



Trevor Paglen *Sight Machine* (2017)

Trevor Paglen created an eerie and beautiful piece with the Kronos Quartet in 2017 in which while the audience watched the string quartet perform, the machines did as well. The machine started by figuring out where the performers were and what they were doing. As the concert progressed, the machine decomposed the images it saw and analyzed them in real time. Computers interpreted the images, using algorithms to figure out if the performers were sad, what they were holding. Displays projected the machine's interpretations of what was happening, so that the humans in the audience could see what the machine was thinking and how it reacted to the musicians on-stage.

Wired Magazine called it [unsettling](#) and indeed it was. For perhaps the first time, a human audience sat alongside an artificial intelligence audience, both interpreting a string quartet performance. Sitting side by side with the machine, the humans were no longer in control, but nor was the computer trying to control them. The computer, in this artwork, is there to watch and enjoy the performance.



AI Agent Smith in The Matrix (1999).

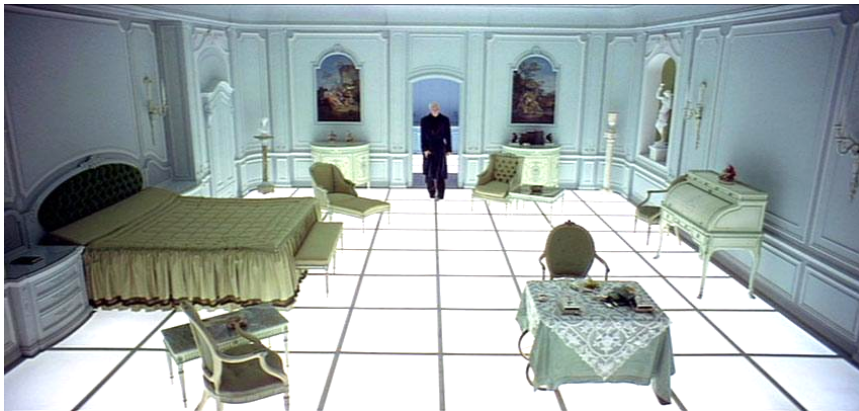
Other artworks depict what the Internet has come to think of people. Notably in the [Matrix](#) (1999) where the networked Artificial Intelligence, [Mr Smith, says](#):

“I’d like to share a revelation that I’ve had during my time here.

It came to me when I tried to classify your species and I realized that you’re not actually mammals. Every mammal on this planet instinctively develops a natural equilibrium with the surrounding environment but you humans do not. You move to an area and you multiply and multiply until every natural resource is consumed and the only way you can survive is to spread to another area. There is another organism on this planet that follows the same pattern.

Do you know what it is? A virus. Human beings are a disease, a cancer of this planet. You’re a plague, and we are the cure.”

The AI, in this rendering, calls us out for our moral shortcomings.



Or in 2001, a Space Odyssey (1968) depicts briefly how we might appear to HAL as the crew is confronting HAL about an error. It is a fish-eyed view of us, but one that engages perceptively the crew as they go about their task.

A much longer scene at the end of the movie is a shot of the spaceman when he finds himself in a sterile white room, presumably on Jupiter. This room might be thought of as a [kind of cage in a zoo](#), where the spaceman is given what he needs to live but is contained. One shot in the movie has a view looking down on the man and the room from a surveillance camera-like angle. Humans ending up in a zoo tended by a higher being is certainly one view of how the Internet and Artificial Intelligence [can evolve](#).

Danny Hillis, my mentor, as we were working at Thinking Machines in the early 1980s [often said](#), “We want to build a machine that will be proud of us.” We were bringing up

the next generation. In my conversations with Carl Feynman at that time, we thought if we were going to be bringing up our new overlords, they should at least read good books. While not of the Internet yet, the computer we were building did share the recognition of the importance of the network, of the interconnections, of the links. The machine we were building was called the "[Connection Machine](#)" where the connections between the processors were seen as important as the tens of thousands of processors themselves. The difference between this machine and the Internet was that these processors were not yet spread around the world.

This imagining of a machine's view of us, a machine that is distinct from us, a machine that has evolved beyond us, brings me around to my original ill-formed vision in 1980 of what I could help make the Internet become: a network of people, the library, and machines. I did not see it in a glorifying or terrifying light, but rather as a major inevitable project that could be built well or badly, and I could help build it well. In that way it could be a major positive step forward.

Will this future unfold or be some other future altogether, we do not know. But technology [reflects those that build it and those that imagine it](#), and so far that is still us.