

Cyberspace Cyberspace arises where human perception meets the network of digital data. In the literal Greek sense of aesthetics (*aisthesis*=perception), cyberspace is electronic information configured for the human senses. It is the “matrix” of civilization where banks electronically exchange money (credit) and where information seekers navigate vast amounts of audio, video, and text stored on computers. Cyberspace first emerged in the 1980s from electronic networks in education and national defense (the Internet), and from commercial information services. A system for accessing vast amounts of computerized data demanded new ways to visualize and interpret information, and cyberspace answered the phenomenological needs of users. Cyberspace is the experiential topography of electronic data, the architecture of networked information as it appears to human users. Like any new cultural terrain, cyberspace breeds a batch of thorny issues related to traditional aesthetics, ethics, and law. Architects debate over fluidity versus stability in cyberspace structures. Many observers see in cyberspace a new stage in human evolution where the sheer quantity of accessible information forces a qualitative leap in the relationship to knowledge. Others see in cyberspace a dangerous neglect of the public spaces that have traditionally nourished human cultures.

Definition in Historical Context

Cyberspace is a spatial metaphor for phenomena that exist in computer networks. People today move objects, such as websites, and personal identity icons, such as avatars, in and out of the cyberspace of electronic computer networks. They work with phenomenologically specific electronic locations on complex electro-physical networks supported by satellite links, global phone connections, and physical routers. People enter electronic space when they watch international news, speak to long-distance friends, or stare at computer monitors for airline destinations. Communication is no longer the simple transmission of a message from point A to point B but becomes a blip of telepresence on a vast network. Cyberspace refers to that independent realm of phenomenologically shared electronic space. But because electronic space contains no inherent aesthetic shape, the way that data gets shaped and configured for human senses becomes a conscious matter of artistic information design.

Cyberspace begins with the set of orientation points by which humans find their way around a vast amount of data. Like the *ars memoriae* of classical rhetoric, cyberspace is a phenomenological entity, an elaborate mnemonic structure for bridging human awareness with raw data. What distinguishes cyberspace from previous structures is its marriage of memory with a software configuration. Magnetic data storage gives no three-dimensional cues for physical orientation, so users must develop an internally imaged sense of the data topology. Network users must additionally work with orientation points that correspond to the conscious design decisions of computer software and hardware. The widely used graphical user interface (GUI) of Apple or Microsoft Windows software is just one example of such an image-laden, iconic representation on personal computers. An iconic interface, along with the mental expectations that correspond to the hardware/software configuration, constitutes the first elements of cyberspace. Added to this are the network links with high-speed satellite or fiber-optic connection, which then offer the true cyberspace of global data representation. The way that links are made and shaped on arrival constitutes another moment of aesthetic design.

The term *cyberspace* first appeared in the science fiction of William Gibson, who in 1984 described it as “a consensual hallucination. ... A graphic representation of data abstracted from the banks of every computer in the human system” (Gibson, 1984). What science fiction depicted in 1984 soon appeared in the actual operations of industry, defense, and academia. Access to vast amounts of information on computer networks

required users to imagine their way around the data in spatial and architectural terms. By the late 1980s, everything from daily banking to National Aeronautics and Space Administration (NASA) space walks depended on the electronic network. At the First Conference on Cyberspace in Austin, Texas, in 1989, the term *cyberspace* served as an umbrella concept to unify the concerns of technicians, artists, computer scientists, architects, social scientists, and philosophers who were addressing the question of how to design the global electronic dataspace. In the 1990s, cyberspace became more manifest in the coalescence of telephone, data, and television services. By 1994, the U.S. federal government—under the Department of Transportation, the National Institute of Standards, and the National Coordination Office for High Performance Computing and Communications—was developing a plan for widening the data superhighway. Since 1993, the hypertext protocol of the World Wide Web determined the quality of data links and the mosaic texture of visual and auditory content streaming through the Internet.

Relation to Tradition

Software systems and hardware interfaces can support a large variety of imaginary structures, leaving cyberspace an open field for architects and designers. Unlike the memory palaces of classical rhetoric, the structures of cyberspace must comply with actual hardware and software configurations while they model an imagined mental architecture. Nor is cyberspace as simple as the Renaissance rhetoricians' memory palace. Instead of a single building with one interior and one exterior, cyberspace represents a universe of relatively independent data systems, resembling much more galaxies or planetary systems. Architects consider cyberspace a sprawling metropolis like Los Angeles rather than a unified city that fans out from a central cathedral. The complexity of cyberspace requires special designs for gateways, links, and security passages. The Internet's ubiquitous "home pages" show only the beginnings of the vast cultural structure that still awaits major aesthetic decisions. From the viewpoint of phenomenology, cyberspace can mimic or resemble actual physical buildings, or it can support more dimensions than any actual physical topography. With a sufficient bandwidth of sensory stimuli, cyberspace can also generate virtual realities or fully immersive environments. As dataspace, however, cyberspace is not a universal simulator but a vast space for high-speed travel. Cyberspace is not itself a virtual reality, but it is the void in which virtual entities can appear. The image of the data highway through cyberspace has captured widespread attention, because electronic space has its own phenomenological remoteness and proximity, its own corners and main streets. Like a highway, the prime purpose of cyberspace is to move and manipulate data at high speeds. More than distant metaphors, the various aesthetic models invoked by designers actually shape cyberspace because raw data cannot itself appear to human senses without the insertion of spatial perception.

Traditional aesthetics emphasizes the shaping of materials, the process of forming earth, stone, paint, and sounds. By its nature—or rather, by its severance from nature—cyberspace undercuts traditional models of the design process. Traditional design imposes form on matter. Even when emphasizing the process of formation, traditional design distinguishes the concept from the product, the idea from the execution in materials. Traditional art allows the final product to manifest the artist's individual signature, a signature inscribed in resistant materials. Because cyberspace is wholly electronic, it eliminates the formation of resistant, earth-based materials. Hardware, such as the phosphorescent picture elements of computer screens, impose some practical limits, but these limits change rapidly as hardware develops. The electronic data remain open for transmutation into any aesthetic shape. Designing anything in cyberspace is tantamount to building it. The artistic hand signature, consequently, diminishes. Just as the notion of the original manuscript fades in importance for word-processing authors, so too cyberspace designers must emphasize the functionality of their craft over the signature of their individual identities.

Cyberspace calls for the artist to become a “space maker,” a void developer, because the artist forms an electronic space devoid of materials. Still, an element of resistance remains for the space shaper. The restrictions on cyberspace reside in its hardware and software configurations. The designer must master enough of the technical details to control the actual platform on which the space making happens. The designer also has to overcome technical resistance by injecting the imaginative power of traditional art. Through the imaginative use of metaphors, the cyberspace artist can overcome hardware and software limitations, because the reality of cyberspace rests neither wholly in its objective conditions nor in the subjective feelings of its users. Metaphors can also engage instinctive archetypal images that release human energy and facilitate the mind's melding with the machine. Again, the simplest example of this appeal to archetypes is the “home page” and “Web site” that localize and personalize data in cyberspace.

Special Problems

The advent of cyberspace has caused a profound shift in the discussion of computing. Previously, the debate centered on the computer as a locus of artificial intelligence. The artificial intelligence debate focused on the computer as a potential rival to human intelligence, as an opponent. The paradigm of artificial intelligence was the chess match where the human vies with a computer rival. The rise of cyberspace, however, shifts the debate to intelligence augmentation. The computer appears not so much as an opponent to human intelligence but as a component of human activity. Computerized devices augment memory and visualization skills. Computing now plays a role in most activities, whether automobile repair or word processing or exploring the moons of Saturn. Cyberspace represents this shift of focus inasmuch as it manifests the field in which human perception meets computer data. To understand computers, we no longer use the paradigm of the chess match but instead understand computers more like contact lenses that augment our vision and that become attached to us so intimately that we hardly notice them. With this shift, the issues of aesthetics take equal place in computing alongside the issues of cognition.

As a component of human activity, the computer must then accommodate its input and output to the human sensory capacity. Our senses are essential for learning about the world, and human imagination must flesh out mental/software abstractions by imposing on them sensory schemata (Immanuel Kant's term), such as spatial and temporal characteristics. The symbiosis of intelligence augmentation, then, implies the spatialization of data as a built-in feature of human intuition. Consequently, the important questions now revolve around the symbiosis of human and machine, of mind and computer, and the task is to discover the various ways in which cyberspace can accommodate the human sensory imagination. Instead of primarily cognitive values, computing now equally explores aesthetic values.

What features should cyberspace have? How should cyberspace designers approach their task? Is the information seeker, submitting subjective queries through Google, at the center of design? What role do large-scale social media, such as Facebook and Twitter, play in the overall design? So far the debate has revolved around the tension between either organizing cyberspace or enjoying its free fluidity. Architects disagree on the relative importance of establishing prior rules for building cyberspace. Electronic structures need not follow the physics of the primary world, but basic laws of stability, identity, and commensurability seem necessary for intelligent navigation. Even though electronic territory can display different dimensions than physical territory, human users may benefit from analogies based on the primary world outside cyberspace. Certain formal rules can guide cyberspace development so cyberspace more closely mirrors the ontology of the primary world. On the other hand, some space makers celebrate the fluidity of electronic

architecture. They see beauty precisely in the freedom from ontological constraints. Forms can follow the builder's stipulations, and without real-world reference, users will feel less restriction in the ways they perceive data. Some have suggested that nonreal-world, fantasy references, such as magic or medieval spiritualism, might better serve as analogues for constructing cyberspace. For its first decades, cyberspace resembled the open frontier of the American continent. Territorial and proprietary rights remained unclear. In early days when the U.S. Department of Defense and the National Science Foundation created the first giant backbones of the Internet, legislators showed no interest in regulating cyberspace, but since the expansion of commerce on the network and since the expansion of the social, economic, and information grid, legislators now seek to regulate and secure the Internet. The Internet was originally constructed out of independent computer modules connected in such a way that even if some nodes were destroyed, the exchange of data would continue; parts of the network could be physically damaged, while the process of data exchange would continue unabated. Consequently, the Internet has never had a central computer, a central node, or a central governing body. As more uses have taken hold in electronic space, a legal framework seems necessary for adjudicating disputes and resolving proprietary claims. Since 2010, cyberspace has become a literal "steering system" (Greek *kybernētēs*: steersman or pilot) for developed societies. Sculpting the architecture and aesthetics of cyberspace must now compete with concerns about cyber-security and the threat of cyber-warefare. To date, it is unclear to what extent and how governments can or will regulate the aesthetic choices of cyberspace designers.

See also [Artificial Intelligence](#); [Computer Art](#); [Digital Media](#); [Hypertext](#); [Multimedia](#); and [Virtual Reality](#).

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