

Inventing the Medium

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This is a landmark volume, marking the first comprehensive effort at establishing the genealogy of the computer as an expressive medium.

Although the name of the book is *The New Media Reader*, its subject is the emergence of a single medium, and one which we can define more particularly than by merely by pointing to its novelty. The *digital medium* which we see emerging in these well-selected and contextualized essays may seem plural to us now, because it is so myriad in its forms—virtual reality CAVEs, the Internet, “enhanced” television, videogames. Indeed, like the medium of film 100 years earlier, the computer medium is drawing on many antecedents and spawning a variety of formats. But the term “new media” is a sign of our current confusion about where these efforts are leading and our breathlessness at the pace of change, particularly in the last two decades of the 20th century. How long will it take before we see the gift for what it is—a single new medium of representation, the digital medium, formed by the braided interplay of technical invention and cultural expression at the end of the 20th century? This reader, reflecting the burgeoning of “New Media Studies” throughout academic life and new media practice throughout the world, should help to hasten that change in our thinking.

Here for the first time within a single volume we can trace the cultural helix, the echoing and opposing strands that form the DNA for cyberspace itself. The first two essays establish the pattern, a call and response of fantasist and engineer, philosopher and inventor. Borges (01), the storyteller-librarian, and Bush (02), the soldier-scientist, speak to us out of the same midcentury frame of mind, exhausted by war, exhilarated by a dawning sense of globalism. They are both almost viscerally aware of the increased complexity of human consciousness and the failure of linear media to capture the structures of our thought. Borges, one of the first fiction writers to place himself in the

expanded context of a global culture, is fascinated by the arbitrariness of language itself, by the flutter of meaning across cultural boundaries. His fiction evokes a sense of flickering focus, of an individual consciousness constantly reforming itself, of an utterance constantly in the process of translation. Borges confronts us with the “pullulating” moment, when we become aware of all the possible choices we might make, all the ways in which we might intersect one another for good or evil. His imagined Garden of Forking Paths is both a book and landscape, a book that has the shape of a labyrinth that folds back upon itself in infinite regression. It is a dizzying vision, one which will be described again by humanist writers for the rest of the century.

For Vannevar Bush, the scientist, the world is not an imprisoning labyrinth, but a challenging maze, waiting to be solved by an appropriately organized and clever team effort. Like Borges, Bush imagines alternate libraries. But where Borges’s visions are playful and subversive of rationalist exploration, Bush dreams of the hyper-rational. He is alarmed to discover that the library shelf is no longer an adequate map of knowledge. Book-based organizational structures have been outpaced by the tempo of investigation, and no longer reflect the constantly reformulating disciplinary boundaries of contemporary scholarship. Knowledge is expanding, but human life remains too short. Where Borges is frozen at the crossroads, enraptured by the proliferating paths, Bush is impatiently searching for the shortcuts, the paths forged by the experts who have scouted the territory before us. He wants to follow in their footsteps and to lay down new trails, trails that do not fade. His engineer’s commitment to the redemptive machine runs throughout this volume as well.

Bush, of course, is not thinking about the “computer”—and neither is Borges. Instead they are inventing fantasy information structures—a book-garden-maze, a desk-library-machine—that reflect not a new technology but a change in how our minds are working. The change they imagine is made more urgent by the experience of two world wars, wars that made apparent the huge gulf between our technological prowess and our social development, between our complex thinking and our atavistic behavior. In Borges’s fable, the protagonist kills a man as a form of information processing, the murdered man being significant only because his name in the newspaper will act as an appropriate coded message.

Bush's example of a representative research subject is the history of bow and arrow technology. He has learned the power of information organization in the context of wartime weapons development, where more knowledge means more power against the enemy.

Central to Borges's story is our discomfort over the narrator's amoral choice, the impersonal, political murder of a man who in alternate "forks" becomes his friend. There is no right side in his warscape; the murderer does not believe in his cause or care which side wins. In the world of the forking path garden, time does not move forward at all, but outward in proliferating possibilities of creation and destruction that make up the totality of human potential. To live in Borges's world is to feel complicity and exhaustion, but also wonder. Bush's view, on the other hand, is moralistic, energetic, and engaged. Implicit in Bush's narrative is the Enlightenment faith in human progress driven by expanded knowledge, the American metaphor of the rich frontier waiting to be conquered by the able trailblazer, the absolute necessity of self-defense. Bush's maze challenges us, but we are smart enough to find our way out. The solution lies in building something, in making something new that will better serve human need. This dichotomy runs through the rest of the century and is echoed throughout this anthology.

All creativity can be understood as taking in the world as a problem. The problem that preoccupies all of the authors in this volume is the pullulating consciousness that is the direct result of 500 years of print culture. One can think of the humanist strand as dramatizing the problem, amplifying our discomfort by denaturalizing the rituals by which we deny it. The disciplinary humanists in this volume, whether artists, theorists, or scholars, are all engaged in foregrounding our cultural confusions, tuning up our sense of existential befuddlement before the scientifically revealed world of the twentieth century. The engineers, on the other hand, put their faith in the invention of the proper instruments, that, like the microscope and telescope before them, will let us focus on the things that baffle and unhinge us so that we can think about them in a systematic way. The right instruments organize not just the outer world but consciousness itself, a phenomenon that is feared by the humanists and embraced by the engineers. The engineers see the central task of our time—finding the key to survival in the atomic age—as a challenge to our intellects. The

world has become more difficult to understand, so we need better ways of thinking about it, more powerful methods of mastering complexity. The library shelf and the chaptered book create both overview and close-up and allow us to move between them without losing our place. What the computer offers us is a more capacious shelf, a finer grained division. The engineers articulate a vision of a new meta-book, a navigable collection of books that will carry us gracefully to the next level of information control and systematic thought, just as the invention of print did 500 years ago. The humanist voices in this survey start off at a greater distance from the material basis of the new medium, and they are often much less hopeful. They find the punch cards of the early information age of little use. They are surveying the wreck of ideologies, coming to terms with the failed promises of print, the horrifying trajectory of the rationalist arrow. They insist that we experience the flickering focus, the slipping away of meaning between the signifier and the signified, that is the intellectual predicament of the second half of the twentieth century.

The authors in this volume line up on both sides of this divide, but they are also facing one another along the braided path. The difference is not so much in what they describe as in their orientation to it. The humanists see the contradictions and limitations of the great systems of thought and it causes them to question the very project of systemized thinking. Such questioning is of their moment but it also is part of a longer tradition of literary and philosophical discourse that articulates the unknowability of life, its tragic dimension, and the absurd and maddening persistence of longing, suffering, need.

The engineers are grounded in a tradition that emphasizes solution and defines the needs it cannot satisfy—and the suffering its solutions can inflict—as outside the domain of the problem. At its worst, the engineering mentality creates efficient killing machines, faster and more deadly arrows. It exults in the ability to "Put-That-There" (◊29), to move weapons around a map with the flick of a magically gloved finger. At its best, it fosters the comic view of the world in which we are resilient enough to problem-solve our way out of our troubles up to the very barrier of mortality itself. At its best, it also celebrates the human capacity to learn and to conceive things that had not been thought of before, things that might make us not just smarter but more creative.

The strands cross one another throughout the period that this anthology delineates, and a single individual often seems to straddle the gap between them. 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. The engineers pace themselves against an accelerating threat of annihilation by the new war technologies; the humanists imagine the machine as a redemptive environment, welcoming the prospect of cyborg architectures that reconfigure our bodies, our cultures, our selves in hopeful ways. The two traditions come together most energetically in collaborations focused on new structures of learning in which exploration of the computer is motivated by a desire to foster the exploratory processes of the mind itself. Gradually, the braided collaboration gives rise to an emergent form, a new medium of human expression.

By bringing these two strands together in this chronologically arranged collection, the editors invite us to look more closely at the rich interplay of cultural practice and technical innovation. We see the scientific culture articulating a medium that “augments” our humanity, that makes us smarter by pooling our thinking and organizing it at a higher level, and even by facilitating new ways of thinking that are more synthetic and have more power to master complex operations and ideas. Meanwhile the arts are engaged in dicing the language and recombining it randomly, calling attention to the arbitrary nature of the written and spoken signifiers, dramatizing the sense of cultural unraveling after two world wars. Seeing all of these players gathered within the boundaries of this one volume we can almost imagine them in a single room, participating in a kind of quilting bee. In one corner, Borges (◇01), Burroughs (◇07), and the Oulipo (◇12) are busy shredding the outgrown garments of print, while across the room Bush (◇02), Engelbart (◇08, ◇16), and the Xerox PARC collaborators (◇26) are eagerly sewing the fragments together into an intricately patterned, vast, and welcoming quilt. The process begins in mid-century, with the earliest understanding by Turing (◇03), Wiener (◇04), and others of the potential of the computer for symbolic representation and for the capturing of complex interactive systems.

Computer languages were developed that allowed for more powerful manipulation of quantitative and text-based data, supporting large databases, scientific and economic simulations, and research in artificial intelligence. The 1960s were a time of dizzying progress for computer scientists, the period in which the field itself was defined, separated from electrical engineering and mathematics with its own advanced degree programs. It was the time when Licklider (◇05) and others were proposing the Internet, when Weizenbaum (◇24) inadvertently invented the first believable computer-based character, when Nelson (◇11, ◇21, ◇30) coined the word “hypertext” and began his lifelong quest to embody it.

And it was the time when Douglas Englebart, looking about him and seeing that the human race was “in trouble,” committed his career to the “augmenting of human intellect.” Had Englebart been given the resources to realize more of his “Framework,” he might have been the prolific Michaelangelo of the computer renaissance, demonstrating how to do many difficult things with maximum expressivity. As it was, he has been a kind of Leonardo, accomplishing much, indirectly influencing much, but leaving behind the unrealized plans for even more. Englebart did not think of the computer as merely improving human thinking, but as transforming the processes of our institutions in a more profound way. The “augmented institution” as he saw it would change not into a “bigger and faster snail” but would become a new species, like a cat, with new sensory abilities and entirely new powers. The evolutionary metaphor is an expression of awe at the magnitude of the shift, a way of sharing the shiver of terror at the unfamiliar rush of mind-power that makes us wonder if we might be capable of outthinking our very humanity.



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