



Making the Book

THE COMPUTER MADE ME DO IT: COMPUTERS AND BOOKS

This essay compares the form, function and experience of reading and writing books with the utilization and creation of narratives on the computer. Topics include: hand-eye coordination, gestures and rituals which characterize computer use; the speed, accessibility and flexibility of computer tools; rules and assumptions which inform the relationship between human and machine; the structural, technical and psychological functions of the interface; the experience of navigation within an electronic narrative structure; the computer user as audience, reader and creator; signs and symbols, the intersection of visual and verbal language; the manipulation of icons, formats, metaphors and scenarios which support computer environments and simulations.

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"I want to do this myself, Hal" he said. "Please give me control."

"Look, Dave, you've got a lot of things to do. I suggest you leave this to me."

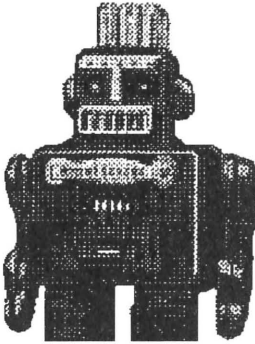
"Hal, switch to manual hibernation control."

"I can tell from your voice harmonics, Dave, that you're badly upset. Why don't you take a stress pill and get some rest?"

Conversation between Hal, a computer, and Dave, the captain of the spacecraft Discovery. Arthur C. Clarke, *2001, A Space Odyssey*. New American Library, 1968.

Working with a computer requires a commitment to specific techniques, parameters, terminology and resources—to electricity, in particular, respect must be paid. While it is true that all tools, powered and self-starting, make similar demands, most do not require two-way communication, and most are not expected to do your thinking for you. It is crossing this line that turns the creator/tool exchange into a relationship, and as with all relationships, shared responsibilities and needs generate some ambivalence between the parties involved. While my experience has been fairly specific, focused primarily on designing graphics and animations for interactive science exhibits and visual fiction, I have become interested in some of the expectations of this new relationship between human and machine: in particular, the ways in which the demands of language, form and structure engage and color the creative process. In *2001*, Hal eventually loses the argument when Dave pulls the plug on the computer's memory, but Dave, cast adrift without Hal's technical support and prophetic voice, must face the future profoundly alone.

I. Getting Up to Speed



Whatever else is promised by the utilization of computers, the values of *speed*, *choice* and *interaction* are central motifs, if not guiding principles. That is, in practice, a computer should provide a solution to a problem or an improvement in service quickly, confidently, transparently and in a way that invites active participation by the customer, technician or creator in charge. But when the computer is asked to serve as more than an intelligent tool, when it becomes a medium to manipulate and explore, as with various graphics and design programs, the exchange becomes more complex. At its best, this relationship goes beyond one of master/slave, hand/switch to become transformative, a fluid collaboration between a creator and a medium. While the same could be said for the experience of reading and writing books the “old-fashioned way,” the process of engaging a computer for those purposes is distinct.

The multiple ways in which this human/machine exchange unfold in the process of writing are probably as varied as the circumstances of each attempt—there continue to be eight million stories in the naked city—but for those who work with word processors to write books, few would argue that the ability to correct, arrange and maneuver through a manuscript at great speed does not in some way inform the end result. In the production of books, the most direct payoff of speed is more time, time that allows for expanded production at less cost. And that means the cheaper delivery of ideas to more people. Desktop publishing, the contraction of the publishing assembly line to desktop scale, embodies that kind of democratic ideal. It is also, analogously, an electronic model of the digestive system—consumption, digestion and elimination in one closed system. This means, at the very least, that the results of production are likely to be mediated primarily by the taste, opinion and judgment of the people present in the room, if not the person sitting alone at the desk. This transforms what was an industrial process—requiring the services of typesetter, printers, designers and editors—into a largely private one, much closer to the rarified domain of artists and writers. For example, the availability of electronic scanners and inexpensive sources of generic clip art make image production at the desktop level available to those who

have never even considered passing through the doors of an art school. But within the computer's domain, artists, writers, engineers and mathematicians are all subject to the same benefits and laws.

Whether word-processing or creating images on the screen, a series of particular gestures and procedures, rituals and signs, characterizes the creative act. Beginning with the choice to sit down before a screen and have a dialogue with it, and continuing into actions which both mimic and displace events in the tactile, sensory world away from the machine, this is a simulated relationship in which content and terms are dictated largely by the person at the controls. In this sense, the monitor screen functions like a mirror which reflects back a picture of the user's expectations, but because this is a world of fixed rules, inhabited by fugitive messages, the relationship requires careful negotiation. In the language of computing, *word-processing* and *image-processing* are sub-strategies of the work *process*. Clearly, there is a bias here towards the manipulation of discrete elements, over the gross handling of clumps of matter. Processing seems to be about passing something through a kind of filter which translates or reconstitutes it so that it is easier to assemble, rearrange or mix with something else. This engages a food-processing metaphor—digitize, blend, puree—which falls apart, for me, at the point where I must imagine vegetables or images put back together after they have been broken down and dispersed. Even if this were possible, the idea of a regenerating particulate structure underlying the image on the screen is too difficult to trust or sustain. I prefer to think of the construction of words and images as an additive, *mosaic* process, where a stable set of discrete elements called *pixels* (short for picture elements) can be selected and combined to form equally stable composite elements like words and shapes.

In the Macintosh "environment" where I reside when computing, the construction process is made concrete through the use of an auxiliary selection device called a mouse, and various accessible tools and techniques identified by graphic icons and visible and hidden *menus* (lists of tools and content). Moving and clicking the mouse activates effects and processes, or provides a way to literally build, move, alter or remove text or images on the screen. While there are ways in which working with the

mouse simulates the act of drawing, you are always at least one step removed from the traditional exchange between the tool and the paper. By extension, you are represented robotically on the screen by the cursor, which, in turn, represents the mouse.

Attached to the chain of command, you move the mouse, and the world moves with you. Drawing in this way is much less about the gesture of the hand or arm, or the pressure and shift of the fingers around a pencil, than about the plotting of a series of logical moves which will result in an image. The standard personal computer is not great at producing delicate lines and curves, but it can multiply, rotate, invert, scale, colorize, cut, paste and erase text and graphics almost instantly. Some of these effects verge on the magical in the way they replicate and extend the events they simulate. Then there are other functions which are not modeled on past experience: to select a word or block of type and instantly transform its font, size or style is a form of alchemy only a computer can provide. More than once, after a day building and destroying images in the pixel world, I have found myself trying to apply its laws to events in the real world. Erasing an error or imperfection is never quite as clean and complete as when it happens on the screen, and the multiplication or procreation of elements to generate a new whole touches on metaphors and techniques that have very little to do with making images.

One example in my own work involved the problem of drawing an image of a plaid bathrobe: I began by multiplying a drawing of a swatch of cloth into a larger cloth. Then, I drew a pattern, in line, for each of the components of the robe: collars, pocket, sleeves and torso. Then, by rotating sections of the fabric, I was able to suggest the folding of the garment. Next, I placed the parts of the pattern over the sections of fabric. Finally, I assembled the robe: sleeves to torso, collars overlapping sleeves, pocket on the left, and then to bring things full circle—that is to give credit where credit was formerly due—I stuck a pencil in the pocket. Ultimately, the drawing owed much more to sewing and Butterick patterns than to art school.

The speed of the manipulation, the multiplicity of choices and the accessibility of the tools can contribute to a fluid exchange of capabilities. Because the monitor screen is

the window or membrane through which the exchange is visualized, this relationship between human and machine can seem transparent, immediate and self-fulfilling. Speed demands more speed, choices generate more choices, and the interaction encourages more interaction. But what the computer gives, the computer can take away. The sense of loss, verging on betrayal, when a piece of work is damaged or inadvertently erased is as intense as the sense of power and control which accompanies the initial production.

II. The Site of the Narrative



An encounter between a human and a machine, considered in terms of its effect on the machine as well as on the human, is a more complex narrative than that inaugurated by a human and a simple tool. Because a computer supplies the stage for the work, as well as the tools, materials and storage space, and because it may even serve in the end product, it certainly seems appropriate to think of it as an *environment*, a word which is also used to describe a package of related hardware and software. An environment can make demands and respond in kind.

Consider the focus and goals of a typical ATM or cash machine in regard to function, service and audience response. Although the bland neutrality of the screen, its controls and textual cues, probably consumed many hours of the design process, the basic interaction provides no unexpected characterization of place or boundary. The screen remains reassuringly neutral, an electronic analog to a sheet of paper which, by way of a short list of choices on a menu and reassuring messages during pauses for processing, frames your response. This is the face of a machine which promises to reliably and objectively dole out cash. On the other hand, as with other human/computer interactions, ease and power can quickly turn to frustration when the authority of the human is called into question. A notification of an *insufficient* balance can provoke both guilt and fury, as if this dumb machine not only refused your request but discovered your insolvency as well. Using a cash machine is a silent exchange with an invisible, but ultimately powerful teller. As a narrative, it is limited: "take out money," with functions like depositing and balance inquiries making that possible. While the transaction actually continues after the cash and the "thank you" appear, the recording of the exchange in the

larger bank system is not visible, although it is implied in the optional receipt. This provides the kind of buffer that a credit card does in shielding the consumer from the direct realization of spent, and therefore, diminished funds.

Maybe it was my forced apprenticeship in the retail shoe business, but the checkbook and the ledger seem harder to ignore. Turning their pages, passing through handwritten listings of credits and debits, is neither magical or friendly. Of course, page-turning is one of the primary experiences the book provides and the computer denies. A derogatory term in computing which implies limited interaction and control, page-turning is one the pleasures of reading, as well as a necessary form of navigation. Within a book, a general narrative terrain is carved out where time and space are characterized and implied. Somewhere a page turns, and "Ten years have passed, and Tom, now sporting a gray beard and forty extra pounds in his gut, is living somewhere else."

In a computer program, on the other hand, boundaries can be more literally defined and more easily transgressed. Navigating through a narrative structure is less about moving through the pagination than about making decisions and forming links between choices. Because there is no apparent front or back of the book, the computer must provide some clear affirmation of an underlying, consistent structure within an essentially open-ended space, framed, but not limited, by the borders of the monitor screen. This must continue to be true whether there is text or image involved, because any evolving information that appears on the screen is essentially gone, invisible, erased when a new choice is made. For it to return, it will have to be reconstituted or called up from storage.

The concept of being "in memory," which is where a computer places information no longer visible on the screen, not only suggests the existence of other states and versions of the data, but also other levels in space where they can reside. On the Macintosh, specific files are represented both by a graphic icon and by a name and description on a menu. These icons and lists function like a kind of floating index, accessible at different stages in the process. To get to the material in a file, you depart from a listing in this index and return to it when you are

done. In this way, whether located at some distant point in the larger coordinate system, enclosed in an icon or some collection device like the Macintosh Scrapbook, text and image are, barring human error and machine dysfunction, retrievable. They may appear gone, but they are not forgotten. Instructions (programming) which provide the basis for all functions, including the hierarchy of representations which form the visible interactive controls (the interface), are likewise out of sight but not out of mind. Don't worry, the computer has it under control. As with the invisible authority of the cash machine, disbelief is suspended by a great leap of faith in the system and the constancy of the screen. If Tom were the progeny of a word-processor, his former self, ten years younger and minus the gray beard and the forty excess pounds, would be somewhere in memory at this very moment.

III. The Flavor of the Interaction



The pencil and paper *Treasure Hunt*, above, presents its means and ends in one visible package. The goal is defined, all possible paths laid out; even the obstacles to success are not hidden. This map of the hunt is the interface, the channel between you and the treasure at the end. While all means and ends are not visible in a book or a computer program, plot structures and flow-charts both trace the lines and connections through which identified goals may be reached. Just as in a game or puzzle, all the routes may not be taken, but boundaries, syntax and rules must be stable for playing to unfold—and not unravel. The map of the *Treasure Hunt* and the role of the player remain the same. It is the pattern of the interaction that changes. What a computer program adds to this equation is both the layering of alternative scenarios and the potential for transforming the qualities of the map itself. Participation may require solving problems, following a set of graphic or textual relationships, uncovering the logic of the system, or experimenting with various strategies and maneuvers for their own sake. But whatever the level of involvement, the fit between the rules of the game, the clarity of the boundaries, and the consistent functioning of the tools must be clear and immediate. Anyone who has ever been cast adrift on a subway platform in New York City trying to interpret a garbled public address announcement, or found themselves on a moving train which has unexpectedly been transformed

from a *local* to an *express*, knows what it means for a complex interactive system to break down.

Like a road map, a computer program is built around defined locations and links. There may be more than one way to arrive, and the choices will inevitably fork at a given destination to encompass at least a return to the beginning, if not a whole new set of locations and links. The developing narrative accumulates rather than unwinds. Each choice not only takes the reader (or user) through the material, but in forming connections and generating new branches provides the experience of collecting, if not building, the content. In a programming application like *Hypercard*, which was designed for the Macintosh, this linking idea becomes a tangible function of the process. A user can create "buttons" or hot spots on the screen out of words or images, which when contacted by the cursor make a direct and visible connection to related elements or ideas. Once established, a path traveled in this way is a field of the user's creation. Because a computer program can also offer multiple, simultaneous destinations and entry points, any location can lead to any other so that where you start is less important than the sequence of the interaction.

This browsing approach to exploring information reflects a social as well as an aesthetic or pedagogical bias. In this democracy, choice is an unassailable value, but the responsibility for making decisions and coping with the results brings up the question of the nature of the audience being "targeted" for the experience. Are they students to be encouraged, peers to be engaged, or consumers to be taken in? Choice implies freedom; interaction promises power. Where within the multiplicity of competing ideas does someone acquire the tools to make judgments and decisions? If the freedom to browse among alternative experiences is the aesthetic and cultural model, then advertising could be considered the ethical sword of democracy, and the right to choose Coca over Pepsi would truly exemplify "the real thing."

In contrast, books are familiar, domesticated objects at this point in our cultural history. They can be opened or closed, shared or carried around without resort to special training, equipment or surroundings. Print literacy is considered an unassailable value as well as a necessity. While bookstores and libraries are certainly for browsing,

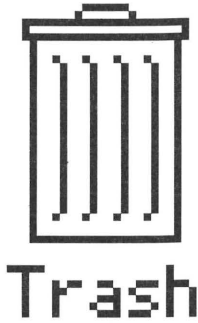
selecting and entering a book is neither passive nor mechanical. Reading implies a commitment that clicking a mouse or scanning with a TV remote does not. As for television, however much a part of the furniture it has become, it is a mute presence that intrudes and demands attention. The computer monitor, a close cyclopean relative, carries the same authority as a bearer of electronic news. For this reason, and because it incorporates time, motion and sequence, the computer should be seen as a performance medium with responsibilities to a captive but participating, audience.

When we refer to the relationship between the creator of a book and the book's intended audience, we talk about the *writer* and the *reader*. Even if the material contains images, as in a magazine, newspaper or comic book, reading is still the process involved. Someone watching a film or television program is a *moviegoer* or *viewer*, even if there are words on the screen to be read. At present, the word used frequently to describe someone who reads, views and uses a computer program is *user*. While it may simply be a matter of familiarity which makes the *reader* and *viewer* acceptable descriptions, there is something faintly distasteful about referring to an audience as *users*—a term which, in English at least, describes either the self-centered manipulation of others or drug addiction. This may also imply something about the computer's role as supplier in the exchange. The question is, are we dealing with the early stages of a form seeking appropriate definitions, or is there some basic distrust of the computer's intentions and grasp? Even someone who compulsively plays pinball or video games is considered a *player*.

My sense is that this ambivalence flows from the concern that unmediated collaborations with computers may be weighted heavily on the computer's side; i.e., the computer may be a bodiless robot, but it is essentially smarter than the person using it. Further, while it is acceptable to set loose *players* to win or lose inside a game, games may not be a sufficiently serious challenge, stacked up against concepts like databases, spreadsheets and telecommunication networks. The computer has talent, and talent, like luck, is a commodity viewed with some suspicion by those who don't feel they have it. In my experience, the standard excuse for an assumed lack of

artistic facility has always been: “I can’t draw a straight line with a ruler.” What replaces that lament in the vernacular when straight lines can be generated by the movement of a mouse in a drawing program?

IV. Taking in the Trash



One solution to demystifying the sometimes abstract nature of computer rules and responses is to suggest that common hand-eye-tool collaborations are still possible. Direct gestures like selecting, dragging (accomplished by positioning the cursor, holding down the mouse button, and pushing or pulling the selected icon), clicking and typing, as well as simulations of activities from the tactile, multi-sensory world outside the machine, make the deep, ambiguous space of the monitor screen seem less alien. On the Macintosh, simple graphic icons are used to identify both form and function in the system. In graphics programs, tools like paint brushes, pencils, spray cans and more arcane functions are displayed and accessed through their respective icons. Files containing text or graphics are represented by a standardized file symbol. Folders, which can contain various hierarchies of files and other folders, are represented by a folder symbol. For me, one of the most elegant solutions is the Mac *trashcan*, through which files and floppy disks exit the digital world of your machine. Using the mouse, you throw a file away by dragging its icon to the trash. To eject either a disk inserted in your disk drive, or a file from another source which has been sent like a phantom across a network of linked computers, you likewise drag its icon to the trash. That all of this takes place on your personal *desktop*—the location on the screen where all your files are presented and stored, and the generative arena where desktop publishing was born—only makes it more friendly. Computers consume and circulate vast quantities of data, so providing a sanitation system seems appropriate. While the *trashcan* incorporates a mixed metaphor in combining disposal and transfer in the same container, I personally find it very satisfying. Kinetically, the gesture is actually cleaner and more decisive than dumping trash—more like flushing a toilet, or dropping a letter down a mail chute.

William Ivins, Jr., in his book *On the Rationalization of Sight*, argues that the essential significance of the development

of perspective during the Renaissance lies in its marking a break with reliance on tactile experience as a means of measuring perception in favor of “visual habits and intuitions.”

From being an avenue of sensuous awareness for what people, lacking adequate grammars and techniques for their use, regarded as “secondary qualities,” sight has today become the principal avenue of sensuous awarenesses upon which systematic thought is based.

On the Rationalization of Sight, Da Capo Press, 1975, p.13.

Does the computer provide the next step on the road from visualization to simulation? If so, sensory awareness will have to compete with *power* and *speed*, the twin gods of computer marketing. From Apple’s “The Power to Be Your Best,” to the now defunct Wang Corporation’s television scenarios of jargonized hyperbole featuring their machine as the absolute mission control of vast, multi-tentacled networks, expanded sensation does not seem to be the point. How big do you want it to be? On the other hand, it is certainly amazing that smaller and smaller machines can perform bigger and bigger tasks. The example of David and Goliath may apply here: the small can compel the large; brain can overtake brawn. And then, there are the related stories of the *apple* and the *seed*, the software and the hardware, all of which would be suitable myths on which to build a resonant, even heroic, saga of the computer.

A myth needs symbols, and I have tried to suggest images—robots, games, mazes, trash collectors and semaphores—that might exemplify some current notions of the computer/human landscape. Each of the pictures used in this essay has been scanned from a print source or selectively “clipped” from the screen, then made into a graphic file and then rendered in print again, by either a laser or ink-jet printer. Whatever their original material identity, they have all been processed by the Macintosh blender. The final image of the semaphore boy, for example, is the product of a selection process peculiar to the age of xerox machines, audio and video recorders, and computers: the wholesale borrowing/“repurposing”/theft of any image or sound that is in public or private circulation. From his original role as a representative of the Boy Scout Jamboree on a 1931

Romanian postage stamp, the semaphore boy calls out and signals to you from his island in the collective sea of images. Reach out and touch someone.

Before there were carphones, beepers and answering machines, before 900 numbers made it possible to have a simulated sexual relationship with a total stranger via telephone, there was a game called “the telephone game.” A group of kids would sit in a circle and then begin to whisper a message from person to person until it reached the ear of the one who first spoke it. What made this interesting, beyond the shared intimacy, was the degree to which the message was altered by the time it made the complete trip around the circle. The “telephone game” was an experiment of sorts, which explored the limits of concentration, memory and trust.

That was then; this is now. Consider a new version of the game, an electronic story, told collectively over a network of computers in different locations around the world. Each person (each semaphore boy or girl) sitting before a monitor would be responsible for contributing another element (image or text) to the story, which could be seen, read and heard simultaneously by all participants. When the story crossed borders, changes of language would require translation. Sitting alone at a terminal, aware of being a necessary link in an unfolding process, on what kind of map would you be operating? Are you a participant or a voyeur, a link or a diversion? Like a blindfolded chessplayer, each storyteller carries the memory or knowledge of past moves, but few clues to the extent or conclusion of the game. There is the sense of a tree—connections growing from a common source—but the branches are not visible. Your mind and the computer’s memory are both processing perceptions *inside*, in preparation for taking action *outside*. The boundary between these two minds is the interface, and the underlying structure which joins them is like a chessboard that you stand on but can’t see. The challenge is to imagine or devise a pattern or strategy so clear, with images and metaphors so apt, that you can pursue the rhythm and pattern of the game even when the ground shifts and the rules change.

Then she began looking about, and noticed that what could be seen from the old room was quite common and uninteresting, but that all the rest was as different as possible. For instance,

the pictures on the wall next to the fire seemed to be alive, and the very clock on the chimney piece (you know you can only see the back of it from the looking glass) had the face of an old man.

Lewis Carroll, *Through the Looking Glass*

