Database Aesthetics

Art in the Age of Information Overflow

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2. Database as Symbolic Form

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The Database Logic

After the novel and subsequently, cinema privileged narrative as the key form of cultural expression of the modern age. The computer age introduces its correlate—database. Many new media objects do not tell stories; they don't have a beginning or end; in fact, they don't have any development, thematically, formally, or otherwise, that would organize their elements into a sequence. Instead, they are collections of individual items, where every item has the same significance as any other.

Why does new media favor database form over others? Can we explain its popularity by analyzing the specificity of the digital medium and of computer programming? What is the relationship between database and another form that has traditionally dominated human culture—narrative? These are the questions I will address.

Before proceeding, I need to comment on my use of the word "database." In computer science, database is defined as a structured collection of data. The data stored in a database are organized for fast search and retrieval by a computer and therefore a database is anything but a simple collection of items. Different types of databases—hierarchical, network, relational, and object-oriented—use different models to organize data. For instance, the records in hierarchical databases are organized in a treelike structure. Object-oriented databases store complex data structures, called "object," which are organized into hierarchical classes that may inherit properties from classes higher in the chain.[1] New media objects may or may not employ these highly structured database models; however, from the point of view of users' experience, a large proportion of them are databases in a more basic sense. They appear as a collection of items on which the user can perform various operations: view, navigate, and search. The user experience of such computerized collections is therefore quite distinct from reading a narrative or watching

a film or navigating an architectural site. Similarly, in literary or cinematic narrative, an architectural plan and database each presents a different model of what a world is like. It is this sense of database as a cultural form of its own that I shall address here. Following art historian Erwin Panofsky's analysis of linear perspective as a "symbolic form" of the modern age, we may even call database a new symbolic form of a computer age (or, as philosopher Jean-François Lyotard called it in his famous 1979 book *Postmodern Condition,* "computerized society,"[2] a new way to structure our experience of ourselves and of the world. Indeed, if, after the death of God (Friedrich Nietzsche), the end of grand Narratives of Enlightenment (Lyotard), and the arrival of the World Wide Web (Tim Berners-Lee), the world appears to us as an endless and unstructured collection of images, texts, and other data records, it is only appropriate that we will be moved to model it as a database—but it is also appropriate that we would want to develop the poetics, aesthetics, and ethics of this database.

I will begin by documenting the dominance of database form in new media. The most obvious examples are popular multimedia encyclopedias (which are collections by their very definition), as well as other commercial CD-ROM or DVD titles, which are collections as well—of recipes, quotations, photographs, and so on.[3] The identity of a CD-ROM as a storage media is projected onto another plane, becoming a cultural form of its own. Multimedia works that have "cultural" content appear particularly to favor the database form. Consider, for instance, the "virtual museums" genre—CD-ROMs that take the user on a "tour" through a museum collection. A museum becomes a database of images representing its holdings, which can be accessed in different ways: chronologically, by country, or by artist. Although such CD-ROMs often simulate the traditional museum experience of moving from room to room in a continuous trajectory, this "narrative" method of access does not have any special status in comparison to other access methods offered by a CD-ROM. Thus the narrative becomes just one method among others of accessing data. Another example of a database form is a multimedia genre that does not have an equivalent in traditional media: CD-ROMs devoted to a single cultural figure such as a famous architect, film director, or writer. Instead of a narrative biography, we are presented with a database of images, sound recordings, video clips, and texts that can be navigated in a variety of ways.

CD-ROMs and other digital storage media (floppies, DVDs) proved to be particularly receptive to traditional genres that already had a database-like structure such as a photo album; they also inspired new database genres,

like a database biography. Where the database form really flourished, however, is on the Internet. As defined by original HTML, a Web page is a sequential list of separate elements: text blocks, images, digital video clips, and links to other pages. It is always possible to add a new element to the list—all you have to do is to open a file and add a new line. As a result, most Web pages are collections of separate elements, such as texts, images, and links to other pages or sites. A home page is a collection of personal photographs. A site of a major search engine is a collection of links to other sites (along with a search function, of course). A site of a Web-based television or radio station offers a collection of video or audio programs along with the option to listen to the current broadcast—but this current program is just one choice among many other programs stored on the site. Thus the traditional broadcasting experience, which consisted solely of a real-time transmission, becomes just one element in a collection of options. Similar to the CD-ROM medium, the Web offered fertile ground to already-existing database genres (for instance, bibliography) and also inspired the creation of new ones such as the sites devoted to a person or a phenomenon (Madonna, the Civil War, new media theory), which, even if they contain original material, inevitably center around the list of links to other Web pages on the same person or phenomenon.

The open nature of the Web as medium (Web pages are computer files that can always be edited) means that the Web sites never have to be complete—and they rarely are because the sites are always growing. New links are being added to what is already there. It is as easy to add new elements to the end of a list as it is to insert them anywhere in it. All this further contributes to the antinarrative logic of the Web. If new elements are being added over time, the result is a collection, not a story. Indeed, how can one keep a coherent narrative or any other development trajectory through the material if it keeps changing?

Data and Algorithm

Not all new media objects are explicitly databases. Computer games, for instance, are experienced by their players as narratives. In a game, the player is given a well-defined task—winning the match, being first in a race, reaching the last level, or reaching the highest score. It is this task that makes the player experience the game as a narrative. Everything that happens in a game, all the characters and objects that one encounters, either take that person closer to achieving the goal or further away from it. Thus, in contrast to the CD-ROM and Web databases, which always appear arbitrary because the

user knows that additional material could have been added without modifying in any way the logic of the database, in a game, from a user's point of view, all the elements are motivated (that is, their presence is justified).[4]

Often the narrative shell of a game ("you are the specially trained commando who has just landed on a lunar base; your task is to make your way to the headquarters occupied by the mutant base personnel . . .") masks a simple algorithm familiar to the player: kill all the enemies on the current level while collecting all treasures it contains; go to the next level, and so on, until you reach the last level. Other games have different algorithms. Here is an algorithm of the legendary game "Tetris." When a new block appears, rotate it in such a way that it will complete the top layer of blocks on the bottom of the screen, making this layer disappear. The similarity between the actions expected from the player and computer algorithms is too uncanny to be dismissed. While computer games do not follow database logic, they appear to be ruled by another logic—that of an algorithm. They demand that a player executes an algorithm in order to win.

An algorithm is the key to the game experience in a different sense as well. As the player proceeds through the game, he or she gradually discovers the rules that operate in the universe constructed by this game. The player learns its hidden logic—in short, its algorithm. Therefore, when a game play departs from following an algorithm, the player is still engaged with an algorithm, although in another way; the player is discovering the algorithm of the game itself. I mean this both metaphorically and literally. For instance, in a first-person shooter, such as "Quake," the player may eventually notice that under such-and-such condition the enemies will appear from the left—that is, the player will literally reconstruct a part of the algorithm responsible for the game play. Or, in a different formulation of the legendary author of Sims games, Will Wright, "Playing the game is a continuous loop between the user (viewing the outcomes and inputting decisions) and the computer (calculating outcomes and displaying them back to the user). The user is trying to build a mental model of the computer model."[5]

What we encounter here is an example of the general principle of new media: the projection of the ontology of a computer onto culture itself. If in physics the world is made of atoms, and in genetics it is made of genes, computer programming encapsulates the world according to its own logic. The world is reduced to two kinds of software objects that are complementary to each other: data structures and algorithms. Any process or task is reduced to an algorithm, a final sequence of simple operations that a computer can execute to accomplish a given task. And any object in the world—

be it the population of a city, or the weather over the course of a century, a chair, a human brain—is modeled as a data structure, that is, data organized in a particular way for efficient search and retrieval.[6] Examples of data structures are arrays, linked lists, and graphs. Algorithms and data structures have a symbiotic relationship. The more complex the data structure of a computer program, the simpler the algorithm needs to be, and vice versa. Together, according to a computer, data structures and algorithms are two halves of the ontology of the world.

The computerization of culture involves the projection of these two fundamental parts of computer software—and of the computer's unique ontology—onto the cultural sphere. If CD-ROMs and Web databases are cultural manifestations of one-half of this ontology—data structures—then computer games are manifestations of the second half—algorithms. Games (sports, chess, cards) are one cultural form that require algorithm-like behavior from the players; consequently, many traditional games were quickly simulated on computers. In parallel, new genres of computer games came into existence, such as a first-person shooter ("Doom" and "Quake"). Thus, as was the case with database genres, computer games both mimic already-existing games and create new game genres.

It may appear at first sight that data are passive and algorithm is active—another example of passive-active binary categories so loved by human cultures. A program reads in data, executes an algorithm, and writes out new data. We may recall that before "computer science" and "software engineering" became established names for the computer field, the field was called "data processing." This name remained in use for several decades during which computers were primarily associated with performing calculations over data. However, the passive/active distinction is not quite accurate because data do not just exist—they have to be generated. Data creators have to collect data and organize it, or create it from scratch. Texts need to be written, photographs need to be taken, video and audio need to be recorded—or they need to be digitized from already-existing media. In the 1990s, when the new role of the computer as a universal media machine became apparent, already computerized societies went into a digitizing craze. All existing books and videotapes, photographs, and audio recordings started to be fed into computers at an ever-increasing rate. Steven Spielberg created the Shoah Foundation, which videotaped and then digitized numerous interviews with Holocaust survivors; it would take one person forty years to watch all the recorded material. The editors of *Mediamatic Journal,* who devoted an entire issue to the topic of "the storage mania" (Summer 1994),

wrote: "A growing number of organizations are embarking on ambitious projects. Everything is being collected: culture, asteroids, DNA patterns, credit records, telephone conversations; it doesn't matter."[7] Once digitized, the data have to be cleaned up, organized, and indexed. The computer age brought with it a new cultural algorithm: reality->media->data->database. The rise of the Web, this gigantic and always-changing data corpus, gave millions of people a new hobby or profession: data indexing. There is hardly a Web site that does not feature at least a dozen links to other sites; therefore, every site is a type of database. And, with the rise of Internet commerce, most large-scale commercial sites have become real databases, or, rather, front-ends to company databases. For instance, in the fall of 1998, Amazon.com had three million books in its database, and the maker of a leading commercial database, Oracle, had offered *Oracle 8i,* fully integrated with the Internet and featuring unlimited database size, natural-language queries, and support for all multimedia data types. Jorge Luis Borges's story about a map,[8] which was equal in size to the territory it represented, became rewritten as the story about indexes and the data they index. But now the map has become larger than the territory—sometimes much larger. Pornographic Web sites exposed the logic of the Web to its extreme by constantly reusing the same photographs from other porno Web sites. Only rare sites featured the original content. On any given date, the same few dozen images would appear on thousands of sites. Thus, the same data would give rise to more indexes than the number of data elements themselves.

Database and Narrative

As a cultural form, database represents the world as a list of items, and it refuses to order this list. In contrast, a narrative creates a cause-and-effect trajectory of seemingly unordered items (events). Therefore, database and narrative are natural enemies. Competing for the same territory of human culture, each claims an exclusive right to make meaning out of the world.

In contrast to most games, most narratives do not require algorithm-like behavior from their readers. Narratives and games, however, are similar in that the user, while proceeding through them, must uncover their underlying logic—their algorithm. Just like a game player, the reader of a novel gradually reconstructs an algorithm (here I use it metaphorically) that the writer used to create the settings, the characters, and the events. From this perspective, I can rewrite my earlier equations between the two parts of the computer's ontology and its corresponding cultural forms. Data structures and algorithms drive different forms of computer culture. CD-ROMs, Web

sites, and other new media objects that are organized as databases correspond to the data structure, while narratives, including computer games, correspond to the algorithms.

In computer programming, data structures and algorithms need each other; they are equally important for a program to work. What happens in a cultural sphere? Do databases and narratives have the same status in computer culture?

Some media objects explicitly follow database logic in their structure, while others do not, but behind the surface practically all of them are databases. In general, creating a work in new media can be understood as the construction of an interface to a database. In the simplest case, the interface simply provides the access to the underlying database. For instance, an image database can be represented as a page of miniature images; clicking on a miniature will retrieve the corresponding record. If a database is too large to display all of its records at once, a search engine enables the user to search for particular records. But the interface can also translate the underlying database into a very different user experience. The user may be navigating a virtual three-dimensional city composed from letters, as in Jeffrey Shaw's interactive installation *Legible City*.[9] Or, the user may be traversing a black-and-white image of a naked body, activating pieces of text, audio, and video embedded in its skin (such as Graham Harwood's CD-ROM *Rehearsal of Memory*),[10] or be playing with virtual animals that come closer or run away depending upon the user's movements (as in Scott Fisher et al. in the VR installation *Menagerie*). Although each of these works engages the user in a set of behaviors and cognitive activities that are quite distinct from going through the records of a database, all of them are databases. *Legible City* is a database of three-dimensional letters that make up the city. *Rehearsal of Memory* is a database of texts and audio and video clips that are accessed through the interface of a body. *Menagerie* is a database of virtual animals, including their shapes, movements, and behaviors.

Database becomes the center of the creative process in the computer age. Historically, the artist made a unique work within a particular medium. The interface and the work were the same—in other words, the level of interface did not exist. With new media, the content of the work and the interface becomes separate. It is therefore possible to create different interfaces to the same material. These interfaces may present different versions of the same work, as in David Blair's *WaxWeb*. They may also be radically different from each other, as in Moscow WWWArt Centre. This is one of the ways in which the principle of *variability* of new media manifests itself.

But now we can give this principle a new formulation. *The new media object consists of one or more interfaces to a database of multimedia material.* If only one interface is constructed, the result will be similar to a traditional art object. This, however, is an exception rather than the norm.

This formulation places the opposition between database and narrative in a new light, thus redefining our concept of narrative. The "user" of a narrative is traversing a database, following links between its records as established by the database's creator. An interactive narrative (which can be also called "hyper-narrative" in an analogy with hypertext) can then be understood as the sum of multiple trajectories through a database. A traditional linear narrative is one among many other possible trajectories—a particular choice made within a hyper-narrative. Just as a traditional cultural object can now be seen as a particular case of a new media object (a new media object that has only one interface), traditional linear narrative can be seen as a particular case of a hyper-narrative.

This "technical," or "material," change in the definition of narrative does not mean that an arbitrary sequence of database records is a narrative. To qualify as a narrative, a cultural object has to satisfy a number of criteria, which literary scholar Mieke Bal defines as follows: it should contain both an actor and a narrator; it also should contain three distinct levels consisting of the text, the story, and the fabula; and its "contents" should be "a series of connected events caused or experienced by actors."[11] Obviously not all cultural objects are narratives. However, in the world of new media, the word "narrative" is often used as an all-inclusive term to cover up the fact that we have not yet developed a language to describe these new strange objects. It is usually paired with another overused word: "interactive." Thus, a number of database records linked together so that more than one trajectory is possible is assumed to constitute "interactive narrative." However, just to create these trajectories is of course not sufficient. The author also has to control the semantics of the elements and the logic of their connection so that the resulting object will meet the criteria of narrative as outlined above. Another erroneous assumption frequently made is that by creating their own path (choosing the records from a database in a particular order), users construct their own unique narrative. However, if a user simply accesses different elements one after another, in a usually random order, there is no reason to assume that these elements will form a narrative at all. Indeed, why should an arbitrary sequence of database records, constructed by the user, result in "a series of connected events caused or experienced by actors"?

In summary, database and narrative do not have the same status in computer culture. In the database/narrative pair, "database" is the unmarked term.[12] Regardless of whether new media objects present themselves as linear narratives, interactive narratives, databases, or something else, underneath, on the level of material organization, they are all databases. In new media, the database supports a variety of cultural forms that range from direct translation (a database stays a database) to a form whose logic is the opposite of the logic of the material form itself—a narrative. More precisely, a database can support narrative, but there is nothing in the logic of the medium itself that would foster its generation. It is not surprising, then, that databases occupy a significant, if not the largest, territory of the new media landscape. What is more surprising is why the other end of the spectrum—narratives—still exists in new media.

The Semiotics of Database

The dynamics that exist between database and narrative are not unique in new media. The relation between the structure of a digital image and the languages of contemporary visual culture is characterized by the same dynamics. As defined by all computer software, a digital image consists of a number of separate layers, each layer containing particular visual elements. Throughout the production process, artists and designers manipulate each layer separately; they also delete layers and add new ones. Keeping each element as a separate layer allows the content and the composition of an image to be changed at any point: deleting a background, substituting one person for another, moving two people closer together, blurring an object, and so on. What would a typical image look like if the layers were merged together? The elements contained on different layers will become juxtaposed, resulting in a montage look. Montage is the default visual language of the composite organization of an image. However, just as database supports both the database form and its opposite—narrative—a composite organization of an image on the material level supports two opposing visual languages. One is modernist-MTV montage—two-dimensional juxtaposition of visual elements designed to shock because of its impossibility in reality. The other is the representation of familiar reality as seen by a photo from a film camera (or its computer simulation, in the case of 3D graphics). During the 1980s and 1990s, all image-making technologies became computer-based, thus turning all images into composites. In parallel, a renaissance of montage took place in visual culture, in print, broadcast design, and new media. This is not unexpected—after all, this is the visual language dictated by the

composite organization. What needs to be explained is why photorealist images continue to occupy such a significant space in our computer-based visual culture.

It would be surprising, of course, if photorealist images suddenly disappeared completely; the history of culture does not contain such sudden breaks. Similarly, we should not expect that new media would completely substitute narrative by database. New media does not radically break with the past; rather, it distributes weight differently between the categories that hold culture together, foregrounding what was in the background and vice versa. As Fredric Jameson writes in his analysis of another shift, in this case from modernism to postmodernism: "Radical breaks between periods do not generally involve complete changes but rather the restructuration of a certain number of elements already given: features that in an earlier period or system were subordinate became dominant, and features that had been dominant again become secondary."[13]

Database narrative opposition is the case in point. To understand further how computer culture redistributes weight between the two terms of opposition in computer culture, I will bring in a semiological theory of syntagm and paradigm. According to this model, originally formulated by Ferdinand de Saussure to describe natural languages such as English, and later expanded by Roland Barthes and others to apply to other sign systems (narrative, fashion, food, and so on), the elements of a system can be related on two dimensions: syntagmatic and paradigmatic. As defined by Barthes, "The syntagm is a combination of signs, which has space as a support."[14] To use the example of natural language, the speaker produces an utterance by stringing together the elements, one after another, in a linear sequence. This is the syntagmatic dimension. Now, let's look at the paradigm. To continue with an example of a language user, each new element is chosen from a set of other related elements. For instance, all nouns form a set; all synonyms of a particular word form another set. In Saussure's original formulation, "The units which have something in common are associated in theory and thus form groups within which various relationships can be found."[15] This is the paradigmatic dimension.

The elements on a syntagmatic dimension are related *in praesentia,* while the elements on a paradigmatic dimension are related *in absentia.* For instance, in the case of a written sentence, the words that comprise it materially exist on a piece of paper, while the paradigmatic sets to which these words belong exist only in the writer's and reader's minds. Similarly, in the case of a fashion outfit, the elements that make it, such as a skirt, a blouse,

and a jacket, are present in reality, while pieces of clothing that could have been present instead—a different skirt, a different blouse, a different jacket—exist only in the viewer's imagination. Thus, syntagm is explicit and paradigm is implicit; one is real and the other is imagined.

Literary and cinematic narratives work in the same way. Particular words, sentences, shots, and scenes that make up a narrative have a material existence. Other elements that form an imaginary world of an author or a particular literary or cinematic style and that could have appeared instead exist only virtually. Put differently, the database of choices from which narrative is constructed (the paradigm) is implicit, while the actual narrative (the syntagm) is explicit.

New media reverses this relationship. Database (the paradigm) is given material existence, while narrative (the syntagm) is dematerialized. Paradigm is privileged; syntagm is downplayed. Paradigm is real; syntagm is virtual. To see this, consider the new media design process. The design of any new media object begins with assembling a database of possible elements to be used. Macromedia Director calls this database "cast," Adobe Premiere calls it "project," ProTools calls it a "session," but the principle is the same. This database is the center of the design process. It typically consists of a combination of original and stock material distributed as buttons, images, video, and audio sequences, 3D objects, behaviors, and so on. Throughout the design process, new elements are added to the database, while existing elements are modified. The narrative is constructed by linking elements of this database in a particular order—designing a trajectory leading from one element to another. On the material level, a narrative is just a set of links; the elements themselves remain stored in the database. Thus, the narrative is more virtual than the database itself.[16]

The paradigm is privileged over syntagm in yet another way in interactive objects presenting the user with a number of choices at the same time—which is what typical interactive interfaces do. For instance, a screen may contain a few icons; clicking on each icon leads the user to a different screen. On the level of an individual screen, these choices form a paradigm of their own that is explicitly presented to the user. On the level of the whole object, the user is made aware that he or she is following one possible trajectory among many others. In other words, the user is selecting one trajectory from the paradigm of all trajectories that are defined.

Other types of interactive interfaces make the paradigm even more explicit by presenting the user with an explicit menu of all available choices. In such interfaces, all the categories are always available, just a mouse click away.

The complete paradigm is present before the user, its elements neatly arranged in a menu. This is another example of how new media makes explicit the psychological processes involved in cultural communication. Other examples include the already discussed shift from creation to selection, which externalizes and codifies the database of cultural elements existing in the creator's mind, as well as the very phenomena of interactive links. New media takes "interaction" literally, equating it with a strictly physical interaction between a user and a screen (by pressing a button), at the sake of psychological interaction. The psychological processes of filling-in, hypothesis forming, recall, and identification—which are required for us to comprehend any text or image at all—are erroneously equated with an objectively existing structure of interactive links.

Interactive interfaces foreground the paradigmatic dimension and often make explicit paradigmatic sets. Yet, they are still organized along the syntagmatic dimension. Although the user is making choices at each new screen, the result is a linear sequence of screens that he or she follows. This is the classical syntagmatic experience. In fact, it can be compared to constructing a sentence in a natural language. Just as a language user constructs a sentence by choosing each successive word from a paradigm of other possible words, a new media user creates a sequence of screens by clicking on this or that icon at each screen. Obviously there are many important differences between these two situations. For instance, in the case of a typical interactive interface, there is no grammar and paradigms are much smaller. Yet, the similarity of basic experience in both cases is quite interesting. In both cases, it unfolds along a syntagmatic dimension.

Why does new media insist on this language-like sequencing? My hypothesis is that it follows the dominant semiological order of the twentieth century—that of cinema. Cinema replaced all other modes of narration with a sequential narrative, an assembly line of shots that appear on the screen one at a time. For centuries, a spatialized narrative where all images appear simultaneously dominated European visual culture. Then it was delegated to "minor" cultural forms like comics and technical illustrations. "Real" culture of the twentieth century came to speak in linear chains, aligning itself with the assembly line of an industrial society and the Turing machine of a post-industrial era. New media continues this mode, giving the user information one screen at a time. At least, this is the case when it tries to become "real" culture (interactive narratives, games). When it simply functions as an interface to information, it is not ashamed to present much more information on the screen at once, whether in the form of tables, normal or pull-down

menus, or lists. In particular, the experience of a user filling in an online form can be compared to precinematic spatialized narrative: in both cases, the user is following a sequence of elements that are presented simultaneously.

A Database Complex

To what extent is the database form intrinsic to modern storage media? For instance, a typical music CD is a collection of individual tracks grouped together. The database impulse also drives much of photography throughout its history, from William Henry Fox Talbot's *Pencil of Nature* to August Sander's monumental typology of modern German society, *Face of Our Time,* to Bernd and Hilla Becher's equally obsessive cataloging of water towers. Yet, the connection between storage media and database forms is not universal. The prime exception is cinema. Here the storage media supports the narrative imagination. We may quote once again Christian Metz, who wrote in the 1970s, "Most films shot today, good or bad, original or not, 'commercial' or not, have as a common characteristic that they tell a story; in this measure they all belong to one and the same genre, which is, rather, a sort of 'super-genre' ['sur-genre']."[17] Why, then, in the case of photography storage media does technology sustain database, while in the case of cinema it gives rise to a modern narrative form par excellence? Does this have to do with the method of media access? Shall we conclude that random access media, such as computer storage formats (hard drives, removable disks, CD-ROMs), favor database, while sequential access media, such as film, favor narrative? This does not hold either. For instance, a book, this perfect random-access medium, supports database forms such as photo albums and narrative forms such as novels.

Rather than trying to correlate database and narrative forms with modern media and information technologies, or deduce them from these technologies, I prefer to think of them as two competing imaginations, two basic creative impulses, two essential responses to the world that have existed long before modern media. The ancient Greeks produced long narratives, such as Homer's epic poems *The Iliad* and *The Odyssey;* they also produced encyclopedias. The first fragments of a Greek encyclopedia to have survived were the work of Speusippus, a nephew of Plato. Denis Diderot wrote novels—and was also in charge of the monumental *Encyclopédie,* the largest publishing project of the eighteenth century. Competing to make meaning out of the world, database and narrative produce endless hybrids. It is hard to find a pure encyclopedia without any traces of a narrative in it and vice versa. For instance, until alphabetical organization became popular a few

centuries ago, most encyclopedias were organized thematically, with topics covered in a particular order (typically, corresponding to the seven liberal arts). At the same time, many narratives, such as the novels of Cervantes and Jonathan Swift, and even Homer's epic poems—the founding narratives of the Western tradition—traverse an imaginary encyclopedia.

Modern media is the new battlefield for the competition between database and narrative. It is tempting to read the history of this competition in dramatic terms. First, the medium of visual recording—photography—privileges catalogs, taxonomies, and lists. While the modern novel blossoms, and academicians continued to produce historical narrative paintings all through the nineteenth century, in the realm of the new techno-image of photography, database rules. The next visual recording medium—film—privileges narrative. Almost all fictional films are narratives, with few exceptions. Magnetic tape used in video does not bring any substantial changes. The next storage media—computer-controlled digital storage devices (hard drives, removable drives, CD-ROMs, DVD-ROMs—privilege database once again. With multimedia encyclopedias, virtual museums, pornography, artists' CD-ROMs, library databases, Web indexes, and the Web itself, database is more popular than ever before.

The digital computer turns out to be the perfect medium for the database form. Like a virus, databases infect CD-ROMs and hard drives, servers, and Web sites. Can we say that database is the cultural form most characteristic of a computer? In her 1978 article "Video: The Aesthetics of Narcissism," probably the single most well-known article on video art, art historian Rosalind Krauss argues that video is not a physical medium but a psychological one. In her analysis, "Video's real medium is a psychological situation, the very terms of which are to withdraw attention from an external object—an Other—and invest it in the Self."[18] In short, video art is a support for the psychological condition of narcissism. Does new media similarly function to play out a particular psychological condition, something that can be called a database complex? In this respect, it is interesting that database imagination has accompanied computer art from its very beginning. In the 1960s, artists working with computers wrote programs to systematically explore the combinations of different visual elements. In part, they were following art-world trends like minimalism. Minimalist artists executed works of art according to preexistent plans. They also created series of images or objects by systematically varying a single parameter. When minimalist artist Sol LeWitt spoke of an artist's idea as "the machine which makes the work," it

was only logical to substitute the human executing the idea by a computer.[19] At the same time, since the only way to make pictures with a computer was by writing a computer program, the logic of computer programming itself pushed computer artists in the same directions. Thus, for artist Frieder Nake, a computer was a "Universal Picture Generator," capable of producing every possible picture out of a combination of available picture elements and colors.[20] In 1967, Nake published a portfolio of twelve drawings that he obtained by successfully multiplying a square matrix by itself. Another early computer artist, Manfred Mohr, produced numerous images that recorded various transformations of a basic cube.

Even more remarkable were films by John Whitney Sr., the pioneer of computer filmmaking. His films such as *Permutations* (1967), *Arabesque* (1975), and others systematically explored the transformations of geometric forms obtained by manipulating elementary mathematical functions. Thus they substituted successive accumulation of visual effects for narrative, figuration, or even formal development. Instead they presented the viewer with databases of effects. This principle reaches its extreme in Whitney's earlier film that was made using an analog computer and was called *Catalog* (1961). In his *Expanded Cinema* (1970), critic Gene Youngblood writes about this remarkable film: "The elder Whitney actually never produced a complete, coherent movie on the analog computer because he was continually developing and refining the machine while using it for commercial work. . . . However, Whitney did assemble a visual catalog of the effects he had perfected over the years. This film, simply titled *Catalog,* was completed in 1961 and proved to be of such overwhelming beauty that many persons still prefer Whitney's analog work over his digital computer films."[21] One is tempted to read *Catalog* as one of the founding moments of new media. Now all software for media creation arrives with endless "plug-ins"—the banks of effects that, with a press of a button, generate interesting images from any input whatsoever. In parallel, much of the aesthetics of computerized visual culture is effects-driven, especially when a new techno-genre (computer animation, multimedia, Web sites) is just becoming established. For instance, countless music videos are variations of Whitney's *Catalog.* The only difference is that the effects are applied to the images of human performers. This is yet another example of how the logic of a computer—in this case, the ability of a computer to produce endless variations of elements and to act as a filter, transforming its input to yield a new output—becomes the logic of culture at large.

DATABASE CINEMA: GREENAWAY AND VERTOV

Although database form may be inherent to new media, countless attempts to create "interactive narratives" testify to our dissatisfaction with the computer in the sole role of an encyclopedia or a catalog of effects. We want new media narratives, and we want these narratives to be different from the narratives we have seen or read before. In fact, regardless of how often we repeat in public that the modernist notion of medium specificity ("every medium should develop its own unique language") is obsolete, we do expect computer narratives to showcase new aesthetic possibilities that did not exist before digital computers. In short, we want them to be new-media-specific. Given the dominance of database in computer software and the key role it plays in the computer-based design process, perhaps we can arrive at new kinds of narrative by focusing our attention on how narrative and database can work together. How can a narrative take into account the fact that its elements are organized in a database? How can our new abilities to store vast amounts of data, to automatically classify, index, link, search, and instantly retrieve it, lead to new kinds of narratives?

Peter Greenaway, one of the very few prominent film directors concerned with expanding cinema's language, complained that "the linear pursuit—one story at a time told chronologically—is the standard format of cinema." Pointing out that cinema lags behind modern literature in experimenting with narrative, he asked: "Could it not travel on the road where Joyce, Eliot, Borges and Perec have already arrived?"[22] While Greenaway is right to direct filmmakers to more innovative literary narratives, new media artists working on the database/narrative problem can learn from cinema as it is. Cinema already exists right in the intersection between database and narrative. We can think of all the material accumulated during shooting forming a database, especially since the shooting schedule usually does not follow the narrative of the film but is determined by production logistics. During editing, the editor constructs a film narrative out of this database, creating a unique trajectory through the conceptual space of all possible films that could have been constructed. From this perspective, every filmmaker engages with the database-narrative problem in every film, although only a few have done this self-consciously.

One exception is Greenaway himself. Throughout his career, he has been working on the problem of how to reconcile database and narrative forms. Many of his films progress forward by recounting a list of items, a catalog that does not have any inherent order (for example, different books in *Prospero's*

Books). Working to undermine a linear narrative, Greenaway uses different systems to order his films. He wrote about this approach: "If a numerical, alphabetic color-coding system is employed, it is done deliberately as a device, a construct, to counteract, dilute, augment or complement the all-pervading obsessive cinema interest in plot, in narrative, in the 'I am now going to tell you a story' school of film-making."[23] His favorite system is numbers. The sequence of numbers acts as a narrative shell that "convinces" the viewer that he or she is watching a narrative. In reality, the scenes that follow one another are not connected in any logical way. By using numbers, Greenaway "wraps" a minimal narrative around a database. Although Greenaway's database logic was already present in his "avant-garde" films such as *The Falls* (1980), it has also structured his "commercial" films from the beginning. *Draughtsman's Contract* (1982) is centered on twelve drawings being made by the draftsman. They do not form any order. Greenaway emphasizes this by having draftsmen work on multiple drawings simultaneously. Eventually, Greenaway's desire to take "cinema out of cinema" led to his work on a series of installations and museum exhibitions in the 1990s. No longer having to conform to the linear medium of film, the elements of a database are spatialized within a museum or even the whole city. This move can be read as the desire to create a database at its purest form: the set of elements not ordered in any way. If the elements exist in one dimension (time of a film, list on a page), they will be inevitably ordered. Therefore, the only way to create a pure database is to spatialize it, distributing the elements in space. This is exactly the path that Greenaway took. Situated in three-dimensional space that does not have an inherent narrative logic, a 1992 installation, *100 Objects to Represent the World,* in its very title proposes that the world should be understood through a catalog rather than a narrative. At the same time, Greenaway does not abandon narrative; he continues to investigate how database and narrative can work together. Having presented *100 Objects* as an installation, Greenaway next turned it into an opera set. In the opera, the narrator, Thrope, uses the objects to conduct Adam and Eve through the whole of human civilization, thus turning *100 Objects* into a sequential narrative. In another installation, *The Stairs-Munich-Projection* (1995), Greenaway put up one hundred screens throughout Munich, each screen representing one year in the history of cinema. Again, Greenaway presents us with a spatialized database—but also with a narrative. By walking from one screen to another, one follows cinema's history. The project uses Greenaway's favorite principle of organization by numbers, pushing it to the extreme: the projections on the screens contain no figuration, just numbers. The screens are numbered from

1895 to 1995, one screen for each year of cinema's history. Along with numbers, Greenaway introduces another line of development. Each projection is slightly different in color.[24] The hundred colored squares form an abstract narrative of their own that runs in parallel to the linear narrative of cinema's history. Finally, Greenaway superimposes yet a third narrative by dividing the history of cinema into five sections, each section staged in a different part of the city. The apparent triviality of the basic narrative of the project—one hundred numbers, standing for one hundred years of cinema's history—"neutralizes" the narrative, forcing the viewer to focus on the phenomenon of the projected light itself, which is the actual subject of this project.

Along with Greenaway, Dziga Vertov can be thought of as a major "database filmmaker" of the twentieth century. His film *Man with a Movie Camera* is perhaps the most important example of database imagination in modern media art. In one of the key shots (repeated few times in the film), we see an editing room with a number of shelves used to keep and organize the shot material. The shelves are marked "machines," "club," "the movement of a city," "physical exercise," "an illusionist," and so on. This is the database of the recorded material. The editor, Vertov's wife, Elizaveta Svilova, is shown working with this database—retrieving some reels, returning used reels, adding new ones.

Although I pointed out that film editing in general can be compared to creating a trajectory through a database, in the case of *Man with a Movie Camera* this comparison constitutes the very method of the film. Its subject is the filmmaker's struggle to reveal (social) structure among the multitude of observed phenomena. Its project is a brave attempt at an empirical epistemology that has only one tool: perception. The goal is to decode the world purely through the surfaces visible to the eye (of course, its natural sight enhanced by a movie camera). This is how the film's coauthor, Mikhail Kaufman, Vertov's brother and cameraman, describes it:

> An ordinary person finds himself in some sort of environment, gets lost amidst the zillions of phenomena, and observes these phenomena from a bad vantage point. He registers one phenomenon very well, registers a second and a third, but has no idea of where they may lead. . . . But the man with a movie camera is infused with the particular thought that he is actually seeing the world for other people. Do you understand? He joins these phenomena with others, from elsewhere, which may not even have been filmed by him. Like a kind of scholar he is able to gather empirical observations in one place and then in another. And that is actually the way in which the world has come to be understood.[25]

Therefore, in contrast to standard film editing, which consists of the selection and ordering of previously shot material according to a preexistent script, here the process of relating shots to one another, ordering and reordering them in order to discover the hidden order of the world, constitutes the film's method. *Man with a Movie Camera* traverses its database in a particular order to construct an argument. Records drawn from a database and arranged in a particular order become a picture of modern life—but simultaneously an argument about this life, an interpretation of what these images, which we encounter every day, every second, actually mean.[26]

Was this brave attempt successful? The overall structure of the film is quite complex, and on the first glance has little to do with a database. Just as new media objects contain a hierarchy of levels (interface/content; operating system/application; Web page/HTML code; high-level programming language/assembly language/machine language), Vertov's film consists of at least three levels. One level is the story of a cameraman filming material for the film. The second level consists of the shots of an audience watching the finished film in a movie theater. The third level is this film, which consists of footage recorded in Moscow, Kiev, and Riga and is arranged according to a progression of one day: waking up, work, leisure activities. If this third level is a text, the other two can be thought of as its metatexts.[27] Vertov goes back and forth between the three levels, shifting between the text and its metatexts—between the production of the film, its reception, and the film itself. But if we focus on the film within the film (the level of the text) and disregard the special effects used to create many of the shots, we discover an almost linear printout, so to speak, of a database: a number of shots showing machines, followed by a number of shots showing work activities, followed by different shots of leisure, and so on. The paradigm is projected onto syntagm. The result is a banal, mechanical catalog of subjects that one can expect to find in the city of the 1920s: running trams, city beach, movie theaters, factories.

Of course watching *Man with a Movie Camera* is anything but a banal experience. Even after the 1990s, during which computer-based image and video makers systematically exploited every avant-garde device, the original is still striking. What makes it striking is not its subjects and the associations Vertov tries to establish between them to impose "the communist decoding of the world," but the most amazing catalog of the film techniques contained within it. Fades and superimpositions, freeze-frames, acceleration, split screens, various types of rhythm and intercutting—what film scholar Annette Michelson called "a summation of the resources and techniques of

the silent cinema."[28] And, of course, a multitude of unusual "constructivist" points of view are strung together with such density that the film can't be simply labeled avant-garde. If a "normal" avant-garde film still proposes a coherent language different from the language of mainstream cinema—a small set of techniques that are repeated—*Man with a Movie Camera* never arrives at anything like a well-defined language. Rather, it proposes an untamed and apparently endless unwinding of cinematic techniques, or, to use contemporary language, "effects."

Why in the case of Whitney's computer films and music videos are the effects just effects, while in the hands of Vertov they acquire meaning? The differences are that in Vertov's film they are motivated by a particular argument, this being that the new techniques to obtain images and manipulate them, summed up by Vertov in his term "kino-eye," can be used to decode the world. As the film progresses, "straight" footage gives way to manipulated footage. Newer techniques appear one after one, reaching a roller-coaster intensity by the film's end, a true orgy of cinematography. It is as though Vertov restages his discovery of the kino-eye for us. Along with Vertov, we gradually realize the full range of possibilities offered by the camera. Vertov's goal is to seduce us into his way of seeing and thinking, to make us share his excitement, his gradual process of discovery of film's new language. This process of discovery is film's main narrative and it is told through a catalog of discoveries being made. Thus, in the hands of Vertov, a database, this normally static and "objective" form, becomes dynamic and subjective. More important, Vertov is able to achieve something that new media designers still have to learn—how to merge database and narrative into a new form.

NOTES

This essay, which later became a chapter in my book *The Language of New Media* (Boston: MIT Press, 2001), was written in the fall of 1998. For this volume, I have made minor changes, for example, substituting a reference to CD-ROM with a reference to DVD.

1. The definition of "database" is from Britannica Online.

2. Jean-François Lyotard, *The Postmodern Condition: A Report on Knowledge,* trans. Geoff Bennington and Brian Massumi (Minneapolis: University of Minnesota Press, 1984), 3.

3. As early as 1985 Grolier, Inc., issued a text-only *Academic American Encyclopedia* on CD-ROM. The first multimedia encyclopedia was *Compton's MultiMedia Encyclopedia,* published in 1989.

4. David Bordwell and Kristin Thompson define motivation in cinema in the following way: "Because films are human constructs, we can expect that any one element in a film will have some justification for being there. This justification is the motivation for that element." Here are some examples of motivation: "When Tom jumps from the balloon

to chase a cat, we motivate his action by appealing to notions of how dogs are likely to act when cats are around." "The movement of a character across a room may motivate the moving of the camera to follow the action and keep the character within a frame." David Bordwell and Kristin Thompson, *Film Art: An Introduction,* 5th ed. (New York: McGraw-Hill, 1997), 80.

5. Chris McGowan and Jim McCullaugh, *Entertainment in the Cyber Zone* (New York: Random House, 1995), 71.

6. This is true for a procedural programming paradigm. In an object-oriented programming paradigm, represented by such computer languages as Java and C++, algorithms and data structures are modeled together as objects.

7. *Mediamatic* 8 (Summer 1994): 1860.

8. Jorge Borges, "The Library of Babel," in *Ficciones,* trans. Anthony Kerrigan (New York: Grove Press, 1962).

9. See http://artnetweb.com/guggenheim/mediascape/shaw.html.

10. Graham Harwood, *Rehearsal of Memory,* CD-ROM (London: Artec and Bookworks, 1996.)

11. Mieke Bal, *Narratology: Introduction to the Theory of Narrative* (Toronto: University of Toronto Press, 1985), 8.

12. The theory of "markedness" was first developed by linguists of the Prague School in relation to phonology, but subsequently it was applied to all levels of linguistic analysis. For example, "bitch" is the marked term and "dog" is the unmarked term. Whereas "bitch" is used only in relation to females, "dog" is applicable to both males and females.

13. Fredric Jameson, "Postmodernism and Consumer Society," in *The Anti-Aesthetic: Essays on Postmodern Culture,* ed. Hal Foster (Seattle: Bay Press, 1983), 123.

14. Roland Barthes, *The Elements of Semiology* (New York: Hill and Wang, 1968), 58.

15. Quoted in ibid., 58.

16. Since all data are stored as electronic signals, the word "material" seems no longer to be appropriate. Instead, we should talk about different degrees of virtuality.

17. Christian Metz, "The Fiction Film and Its Spectator: A Metapsychological Study," in *Apparatus,* ed. Theresa Hak Kyung Cha (New York: Tanam Press, 1980), 402.

18. Rosalind Krauss, "Video: The Aesthetics of Narcissism," in *Video Culture,* ed. John Hanhardt (Rochester, N.Y.: Visual Studies Workshop, 1987), 184.

19. Quoted in Sam Hunter and John Jacobus, *Modern Art: Painting, Sculpture, and Architecture,* 3rd ed. (New York: Harry N. Abrams, 1992), 326.

20. Frank Dietrich, "Visual Intelligence: The First Decade of Computer Art, 1965–1975," *IEEE Computer Graphics and Applications* (July 1985): 39.

21. Gene Youngblood, *Expanded Cinema* (New York: E. P. Dutton, 1970), 210.

22. Peter Greenaway, *The Stairs—Munich—Projection 2* (London: Merrell Holberton Publishers, 1995), 21.

23. Quoted in David Pascoe and Peter Greenaway, *Museums and Moving Images* (London: Reaktion Books, 1997), 9–10.

24. Pasco and Greenaway, *The Stairs—Munich—Projection 2,* 47–53.

25. Mikhail Kaufman, "An Interview," *October* 11 (Winter 1979): 65.

26. It can be said that Vertov uses the "Kuleshov effect" to give meaning to the database records by placing them in a particular order.

27. Linguistics, semiotics, and philosophy use the concept of metalanguage.

Metalanguage is the language used for the analysis of object language. Thus, a metalanguage may be thought of as a language about another language. A metatext is a text in metalanguage about a text in object language. For instance, an article in a fashion magazine is a metatext about the text of clothes. Or, an HTML file is a metatext that describes the text of a Web page.

28. Kaufman, "An Interview," 55.