Hypermedia as Art System

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The project *Deconstructing Duchamp* began in the summer of 1996 when I proposed a collaborative Internet work involving twenty-five participants in an attempt to lateralize Marcel Duchamp's *La Mariée mise à nu par ses célibataires, même* (The Large Glass) by reconfiguring *The Bride Stripped Bare by Her Bachelors, Even* from a two-dimensional field into twenty-five interlinked elements across the network field. Each element of the *Large Glass,* that is, nine Malic molds, the Chocolate Grinder, the Bride, and so forth, was to have its own web page for gathering the ideas, theories, quotations, diagrams, illustrations, sounds, images surrounding that particular element. *The Glass* was then structured in the fourth-dimensional space of the Net by the interlinking of these elements. The linkage was based on the semantic associations between elements of *The Glass* that had arisen from the collated multimedia information. Such cross-connections could only be upheld within a hypertext/media environment. I consider the project to be a natural progression from Richard Hamilton's purely typographic version of *The Large Glass* (1960), bypassing the next stage of hypertext, to include images and sound in hypermedia. The work is now entitled *4-D Duchamp* and can be accessed through the numbered "Glass" door *(fig. 1)* in the Caiiamind website; from there many routes can be taken, each leading to a different view of the piece.[1] *4-D Glass* explicitly displays Duchamp's associated thoughts and ideas held within the original as indicated by his notes. It is hoped that engaging with this Net work will uncover new meanings and possibly lead to new interpretations.

The Internet project is the first approach and concerns the interlinking only of the named items in *The Glass;* it does not yet cover the whole piece as an art system. It exists as a small contained system within the mother system of the Internet. It is also part of another system, my next and larger project, which takes a more holistic view of *The Glass* by making it a semantic network to be transposed into hypermedia. The Bride and Bachelor (or female and male halves of *The Glass*) are indicators of the navigation possibilities for such a hypermedia art system, and it is this which will next be explored and, it is anticipated, inform artistic practice in hypermedia.
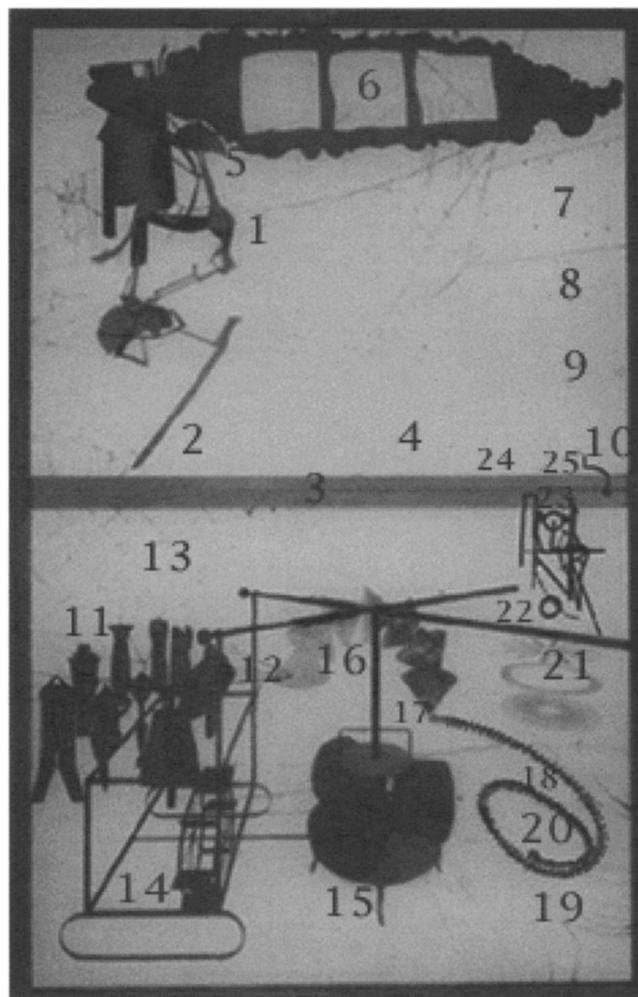

FIG. 1 The numbered version of Marcel Duchamp's unfinished *Large Glass,* entitled *La Mariée mise à nu par ses célibataires, même* (1923), which serves as the doorway to Dew Harrison's *4-D Duchamp.* Caiiamind website, 1996.

Duchamp's body of work is riddled with cross-references and complex meanings generating many different interpretations through its apparent ambiguity. *The Large Glass* (1923), together with its semantic key, *The Green Box* (1934), consisting of ninety-three documents, sketches, calculations, and notes from 1911–15, contains a wealth of associated links proffering the conjunction of images and text ideal for hypermedia. The piece is generally regarded to be both the culmination and the summation of Duchamp's
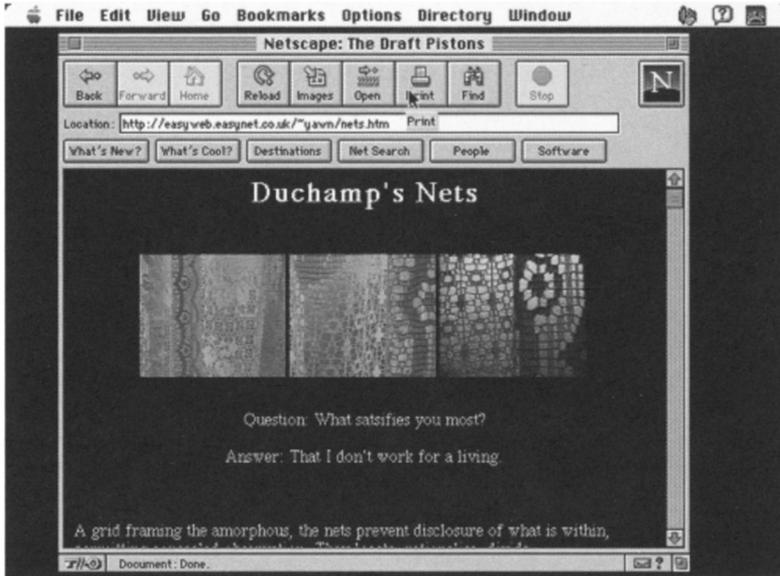
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FIG. 2 Andrew Strong's page in the Duchamp project. His element is point 6, the Draft Pistons (or Nets).
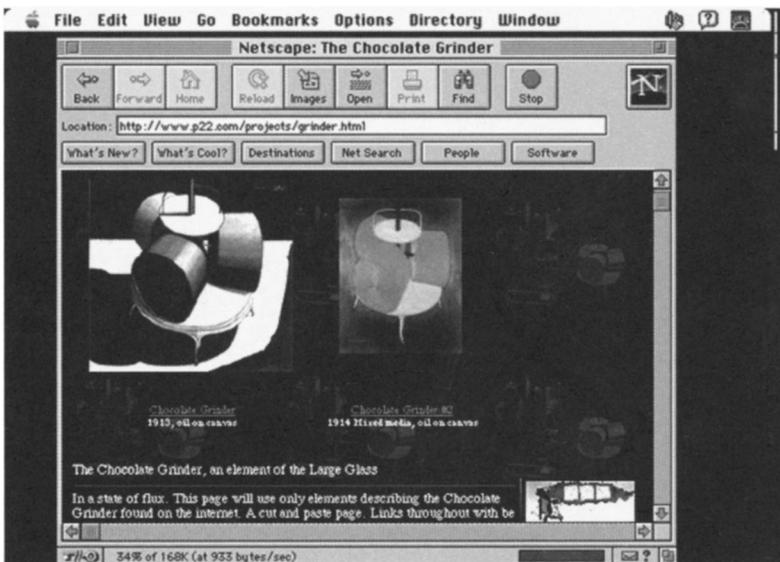

FIG. 3 A page from Richard Kegler's site in the Duchamp project. His element is point 15, the Chocolate Grinder.
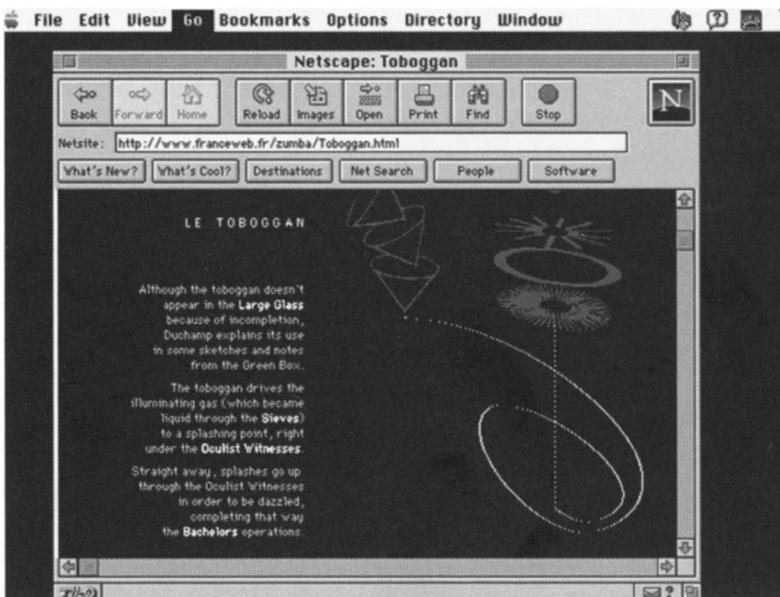

FIG. 4 The Toboggan site by Jean-Luc Thierry, point 18 in the project.

work, occupying his thoughts between 1912–23, when he abandoned it as finally unfinished.

The notes in the boxes (he produced a white box, *À l'infinitif*, many years later, in 1966) are not clear instructions or explanations and are often opaque and indecipherable. Some are fairly stable descriptions of the identifiable objects that occupy the picture space, the elements referred to in the Net project. These images embody abstract but conceptually precise relationships. The conceptual germ of *The Large Glass* was the relationship of virginity to bridehood: there is no marriage; there are "bachelors," not a bridegroom; no husband and wife.[2] Duchamp states that a bride is the "apotheosis of virginity." Bridehood lasts one day, the wedding day, and consummation marks its end. Bridehood is the precondition of the passage to womanhood. *The Large Glass* depicts this last or peak moment before change, and Duchamp refers to it as a "Delay in Glass."[3] It is impossible to describe *The Glass* in one paragraph of text, but here is a simplistic overview.

The Glass and its accompanying notes depict a set of symbols. The symbols for the Bride in the top half are abstracted forms previously explored through four paintings and a drawing, all completed around 1912 when Duchamp, then twenty-five, began to formulate *The Large Glass*. The paintings concerned a particularly vivid dream he had in which the Bride took the form of a giant, aggressive, beetle-like insect. The Bride (point 1) is positioned in the top-left corner; to her right is the "Top Inscription" (or "Milky Way" [point 6]) surrounding the three "Draft Pistons" or "Nets" *(fig. 2)*. Based on photographs of wind blowing a piece of gauze material, these catch and sift through the Bride's thoughts, dreams, and desires, which evaporate through the "Nine Shots" (point 7). In the bottom half (point 3), the Bachelors are seen as "Nine Malic Molds," parts in a machine that is pictured with painstaking precision but only pretends to work in a mechanical way. The Bride's (abstracted) "stripping" causes the Bachelor "glider" containing the "Water Mill" to "sing litanies" of "slow life, onanism etc." to the "Malic Molds," which swell with "illuminating gas." This rises out of the molds and moves as "spangles" through the "Capillary Tubes" to the "Sieves" (or "Parasols") motivated by the "Chocolate Grinder" *(fig. 3)*. Here the spangles are converted into liquid form experiencing "dizziness." They fall along the "Toboggan" or "Corkscrew" *(fig. 4)* into a "splash."[4] Above the splash are elements associated with the visual effects of lenses, mirrors, and optical illusions, in an effort to raise the splash above the horizon.

The Large Glass was originally constructed in the form we now know it over seventy years ago; this encasement of connected ideas was the nearest Duchamp could get to his goal. It is only now that technology has made possible that which was impossible in Duchamp's time, the four-dimensional art piece. Whether he would have used the Internet had it been available as a medium is uncertain, what is certain is his interest in the possibility of four-dimensional art. When Duchamp was exploring ways to portray his Bride in the fourth dimension, he began with painterly abstractions of the figure. His experiments culminated in exploiting the flatness of glass as a material approaching "no thickness," or *inframince*, and therefore acting as signifier to the fourth dimension.[5] He replaced traditional (thick) paint and canvas as tools for picture making and renounced painting, declaring his *Glass* to be "a three-dimensional physical medium in a fourth-dimensional perspective."[6]

From Duchamp's notes, mostly in *The White Box*, it would seem that his interest in the fourth dimension was aligned, not to the then contemporaneous relativity theory proposed by Einstein, but to the idea that the fourth dimension could be understood through geometry progressing from the n-dimension. A single point has no (n) dimensions; two points define a line and have one dimension; two lines create a plane and have two dimensions; yet if two planes create a volume or a three-dimensional space or object, what do two volumes create? Duchamp suggested that they should create a fourth-dimensional space or object. Western art has been traditionally concerned with two-dimensional representations of three-dimensional spaces. Duchamp considered that if two-dimensional images could stand for a world of three-dimensional objects, it would follow that three-dimensional objects could represent things in a four-dimensional world. He conceived the "Bride" as a three-dimensional representation of a four-dimensional being, as a "two-dimensional representation of a three-dimensional bride who herself would be the projection of a four-dimensional bride in the three-dimensional world."[7]

Painters are two-dimensional artists working on a flat plane, sculptors are three-dimensional artists working with objects/space, and we now have digital artists working in the four dimensions of cyberspace, concerned with the space/object incorporating time. Duchamp's notes show many attempts to portray the fourth dimension. But as the fourth dimension cannot be approached by the three-dimensional senses used to refer to traditional pictures, his

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work remained an enigma to the viewers of his time. The fourth dimension as conceptually perceived and the technology to convey it had not been invented in Duchamp's time. Now we have hypermedia, the ideal medium for structuring concepts, and we have the hyperlink base of the Internet. It is possible that this new technology was what Duchamp was searching for, hence *4-D Duchamp*.

Undertaking this project raised many questions concerning the use of hypermedia as an artistic medium. My understanding of this database system came from computer scientists and information technologists, and it was from this perspective that I could see this new technology enabling the linkage of associated ideas as multimedia items in the complex system of a conceptually rich artwork. There is evidence of artists coming into contact with the medium of hypermedia through their interest in the Internet, our contemporary culture's information channel: a scan across the World Wide Web reveals numerous artists' websites. The evidence also shows that few of them are aware of the true potential of this new medium, the underlying hyperlink base, which is directly related to the concept behind the development of hypermedia. Together with this positive attribute I am now aware of a negative one: any artist constructing a hypermedia art system will confront the same problems as any other hypermedia builder—navigation. Hypermedia-system navigation has kept computer scientists occupied for over twenty years.

Three main issues have arisen from this project: 1) the concept behind hypermedia and its relation to art; 2) the search for evidence of artists using the Internet as a hypermedia system; and 3) the navigation problems to be encountered when constructing hypermedia art systems. I will begin by defining *hypermedia*. Hypermedia is a database storage and retrieval mechanism that has been developed to emulate human cognitive processes. A technology that has emerged over the last twenty years, it concerns itself with enabling users to navigate through structures of semantically associated items. A hypermedia system has a nonlinear structure, permitting the user to navigate its store of information through a choice of pathways. It is a combination of random access and multiple media. The information can appear as text/hypertext, graphics, sound, animation, or video.

Hypertext is an evolving conception of the possible applications of human-computer interaction. Many people have contributed to the idea, but the original vision is attributed to Vannevar Bush, President Roosevelt's science advisor, who first approached a description of hypertext in his article "As We May Think," from 1945.[8] The article introduces his memory-extension system, or Memex, which was to let the user browse and make associative links between any two points in a library of scientific literature, sketches, photographs, and personal notes. Bush termed this procedure "selection by association," based on an understanding of human thinking where "[t]he human mind . . . operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thought; in accordance with some intricate web of trails carried by the cells of the brain."[9] This was before the computer was sophisticated enough to fulfil the vision. He did not anticipate the power of the digital computer, and so his Memex used microfilm and photocells.

Almost twenty years later, Bush's work influenced Douglas Engelbart, the inventor of the "mouse," at the Stanford Research Institute, who published "A Conceptual Framework for the Augmentation of Man's Intellect" in 1963.[10] Engelbart envisioned that computers would usher in a new stage of human evolution, characterized by "automated external symbol manipulation"; his proposed system included the human user as an essential element. The system considered the user and the computer to be dynamically changing components in a symbiosis which had the effect of "amplifying" the native intelligence of the user (an "interactive" system). He then constructed the Augment system, or NLS (oN Line System), at the Augmented Human Intellect Research Center at the SRI in 1968 to enhance human intellect. This system had a database of nonlinear text, "view filters," which selected items from this database, and "views," which structured the presentation of this information for the terminal. The availability of workstations with high-resolution displays shifted the emphasis to more graphic depictions of nodes, links, and networks, such as using one window for each node.

Meanwhile, another hypertext visionary was developing his own ideas about augmentation. Ted Nelson, the originator of the term *hypertext*, defined as "non-sequential writing," was creating Xanadu (1967), a unified literary environment on a global scale. His intention was to place the entire world's literary corpus on-line. "Under guiding ideas which are not technical but literary, we are implementing a system for storage and retrieval of linked and windowing text." Nelson stated that the value of hypertext is that "it more closely models the way we think," allowing us to explore a subject area from many different perspectives.[11] The mental model underlying a hypermedia system is nonlinear, mimicking the brain's ability to store and retrieve information by referential links for quick and intuitive access. Randall Trigg wrote the first doctoral dissertation on hypertext in 1983, describing nonlinear text as "primitive pieces of text connected with typed links to form a network similar in many ways to a semantic net."[12]

Semantic networks are an artificial intelligence concept for knowledge representation consisting of a directed graph in which concepts are represented as nodes, and in which the relationships between concepts are represented as the links between them. These networks are semantic in that the concepts in the representation are indexed by their

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semantic content rather than by some arbitrary (e.g., alphabetical) ordering. Semantic networks are natural to use, as related concepts tend to cluster together automatically, and an inconsistent or ill-defined concept is easily identified by its neighboring, linked concepts, which provide it with a meaningful context. Trigg's analogy with hypertext holds where the nodes are hypertext nodes representing single ideas, with links between them representing the semantic interdependencies among these ideas. Hypertext can then capture an interwoven collection of ideas without regard to the ability of a machine to interpret them, which is the way semantic nets are employed by AI knowledge engineers. As hypertext can help people combine ideas to form concepts, so hypermedia can help people combine multimedia ideas to form concepts. This is the area in which I think neoconceptual artists should be experimenting. Hypermedia is not merely the latest tool to create "good art"; it is the best medium for constructing and presenting innovative artistic ideas. Hypermedia should be used as an art system.

The coherent linkage of items in a hypermedia system is paramount to user access. Knowing how to navigate through the Web and where/how to participate is essential if full interactive collaboration is to be attained. The connectedness of items within the system must therefore be made known to anyone who engages with it. A true hypermedia network should be moving the boundaries of the computer-human interface toward invisibility and therefore toward the synthesis of the human-computer dichotomy. Hypermedia is the new tool for complexity management; it is conceptually driven and not technology-led. It would seem that some sort of mental construct, some picture metaphor or idea-node linking, is required that can be conveyed to the system visitor for meaningful navigation and control purposes. But there also needs to be a trade-off between complexity and flexibility. It should be a fluid structure embodying ideas, a flexible frame of concepts, concept modeling, the hypermedia system as the emergent embodiment of concepts. It should show that the window-onto-the-world metaphor is passive and replace it with the doorway-to-the-world metaphor, implying the two-way interactive nature of the beast.

Research undertaken in hypermedia has so far come from the world of scientists. This has highlighted the advantages and problems of the associative linkage structures embedded in hypermedia databases and proposed solutions derived from the traditional Western formal mental barriers constructed in the age of reason, of step-by-step cause-and-effect deduction and the linear sequential theorizing of classical science. Hypermedia enables the complex relationships among informative items the necessary intensive selective linking by association rather than by indexing. In so doing it becomes a semantic network of nonsequential interlinked items. It would seem from this that navigation of such a system may be limited by Western linear methods and that nonlinear geographical navigation methods from other cultures may be adapted for the hypermedia system user to inform the linkage design structure.[13] The information space of a hypermedia system is that of a semantic network of idea-nodes, and this structuring renders cognitive models based on hierarchical, linear-sequential strategies, or top-down mechanisms unsuitable and inapplicable by the very nature of the three-dimensional domain metaphor applied to semantic webs.

It is my opinion that the focus for research in this field should now come from artists. They should be concerned with replacing the Cartesian grid reference, unsuitable for nonlinear worlds, with a more appropriate multidimensional metaphor derived from the holistic and intuitive navigation methods based on embodiment, where "the navigator takes his actual bodily position as constant and judges all relativistically according to that reference."[14] Since methods from the graphic designer and desktop publisher such as storyboarding also rely on the linear-sequential, these too are restrictive and limiting. It is now up to the artist to take the lead through exploration and experiment. The aim should be to make users feel embodied within the system, directly manipulating nodes and links easily, almost unconsciously in their own personal trail of discovery to unfurl the meaning/s held within the system. ━━

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Notes
1. *4-D Duchamp* website: (http://caiiamind.nsad.gwent.ac.uk/lead.html).
2. Michel Sanouillet and Elmer Peterson, eds., *The Writings of Marcel Duchamp* (New York: Thames Hudson, 1989), 42.
3. Ibid., 39.
4. Ibid., taken from Duchamp's notes, the words in quotation marks are his own terms.
5. Arturo Schwarz, ed., *Notes and Projects for the Large Glass* (London: Thames Hudson, 1969), 15.
6. Ibid., 80.
7. Arturo Schwarz, *The Complete Works of Marcel Duchamp* (London: Thames Hudson, 1969), 23.
8. Vannevar Bush, "As We May Think," *Atlantic Monthly*, July 1945, 101–8
9. Ibid., 106.
10. Douglas Engelbart, "A Conceptual Framework for the Augmentation of Man's Intellect," in *Vistas in Information Handling*, vol. 1 (New York: Spartan Books, 1963), 83–98.
11. Tom Nelson, *Computer Liberation/Dream Machines* (New York: Tempus Books, 1987), 46.
12. Randall H. Trigg, "A Network-based Approach to Text Handling for the On-line Scientific Community," Ph.D. diss., University of Maryland, 1983, 15.
13. I refer here to navigation methods employed by nonlinear cultures such as Australian aboriginal songlines and Hopi sand paintings. In particular the culture and nonlinear language of the Trobrianders of the South Pacific have been rigorously studied and well-documented by anthropologists such as Mary Mead and the linguist Dorothy Lee in the 1960s.
14. D. Idhe, "New Technologies/Old Cultures," in *Research in Technology Studies*, vol. 6 (London: Associated University Presses, 1992), 91.

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