

Rockwell, Geoffrey, "Diderot and Hypertext." Unpublished essay presented in January, 1999 to the *McMaster Association for Eighteenth-Century Studies*.

# Diderot and Hypertext; Dreaming the Circle of Knowledge

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One of the most significant information technology developments of the end of the 20<sup>th</sup> century is the World Wide Web. The WWW, designed by Tim Berners-Lee in the late 1980s and implemented in 1991, while not technologically innovative or original in conception, was the first practical and easy to use networked hypertext system. The open character of the two major protocols (HTML and HTTP), the availability of free software for major platforms, and the graphical capabilities of the WWW led to its rapid evolution and explosive growth. Who remembers the systems that preceded it like Gopher, HyperCard, or Guide?

The WWW did not come from nowhere. Thinkers like Ted Nelson have been writing about and developing hypertext systems since the 1960s when he coined the word. Traditionally histories of hypertext start with the influential article by Vannevar Bush entitled "As We May Think" that was published in *The Atlantic Monthly* in 1945.<sup>1</sup> While a few writers like Nelson comment on how hypertext systems have existed for centuries without computers to automate them, discussions of these "proto-hypertexts", to use Landow's term, rarely pay attention to the thoughts of those who struggled to imagine different ways of organizing information.<sup>2</sup> In this paper I am going to focus on Denis Diderot's thoughts on ways of structuring encyclopedic information and what we can learn from them about the genesis of hypertext. I will begin by recapitulating Nelson's

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<sup>1</sup> See Nyce and Kahn, *From Memex to Hypertext* which reprints Bush's article along with related pieces. In particular there an article "Memex as an Image of Potentiality Revisited" by Linda C. Smith where she follows the influence of Vannevar Bush's idea of the Memex. Here is a quote from that article, "During the 1980s, 'As We May Think' is cited most often as a significant publication in the history of hypertext." (p. 265) She goes on to quote Nielsen (1989) to the effect that Bush is the "grandfather" of hypertext.

<sup>2</sup> See Landow, *Hypertext: The Convergence of Contemporary Critical Theory and Technology*.

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definition of hypertext in terms of the more familiar World Wide Web. I will then look at two works by Diderot, his article in *l'Encyclopédie* on the Encyclopedia and the dialogue *D'Alembert's Dream*. In these two works I believe we can see one of the more creative minds of the 18<sup>th</sup> century imagining how information might be structured and how that mirrors the organization of the mind.

Ted Nelson in "Literary Machines" defined hypertext in the following way:

Well, by "hypertext" I mean non-sequential writing--text that branches and allows choices to the reader, best read at an interactive screen.

As popularly conceived, this is a series of text chunks connected by links which offer the reader different pathways.<sup>3</sup>

This definition covers a number of the important points about hypertext. First, a hypertext is non-sequential. This is both a trivial and sophisticated point. On the one hand Nelson is defining hypertext as type of structured information that does not have a default sequence in which it should be read the way a novel does. On the other hand it is about the way meaning is generated by the sequencing of information.

Second, the non-sequentiality leads to a different relationship between author and reader. The reader of a hypertext has to make choices about what they are going to read and in a sufficiently large hypertext this will mean that no two readers will have covered the same ground in the same order. There is thus no closure to the reading of a hypertext the way there is with a traditional printed work. The reader constructs the text or pathway through the hypertext as they make their choices and each reading could therefore be substantially different in the sense that the actual information read could be different not just the interpretation of the information.

Third, Nelson provides us with what is now a standard way of implementing hypertexts. As he puts it, a hypertext is a series of chunks, or nodes of information, connected by

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<sup>3</sup> Nelson, *Literary Machines*, p. 0/2.

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links. Thus the hypertext resembles in theory an encyclopedia with articles as the nodes and references as links. You can see why Diderot might be of interest here.

Finally, he suggests that the best way to read a hypertext is at an interactive screen. It is interesting that he does not suggest that this is the only way; in fact elsewhere he comments on how printed texts can also be hypertextual like the choose-you-own-ending type of children's adventures where you make choices at the end of each chapter as to how you would react and thus link to other chapters. What Nelson is getting at is that it is easier to implement a large hypertext at an interactive screen that can instantaneously link you from node to node at the press of a button or click of the mouse. He actually goes further to say he is interested in types of texts that cannot be printed.

A couple of other points should also be made about Nelson's vision of hypertext that are not captured in this definition.

In *Literary Machines* Nelson presents a description of the Xanadu Hypertext System that he led and promoted over the years. This system was never successfully implemented despite a period during which Autodesk (the developers of AutoCad) supported the project.<sup>4</sup> Two of the features of Xanadu that are important are that it was a networked hypertext system designed to support a docuverse or universe of documents by subscribers to the system and that it was designed to have a royalty payment mechanism incorporated so that anyone who read a document could be billed for the reading. The Xanadu docuverse was designed to allow people to build new documents from nodes of other documents and credit both the new author and original authors accordingly. In order to make this work with dynamic documents that could be changed by the original authors Xanadu kept track of the history of each document so that links to earlier versions could be maintained.

It is interesting to contrast Nelson's vision with that of Bush on the one hand and the WWW on the other. Bush's Memex, which was the personal photomechanical hypertext

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<sup>4</sup> For more on the history of Xanadu see Wolf, Gary. "The Curse of Xanadu."

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system he imagined in 1945, was designed to deal the problem of the explosion in the scientific and scholarly record. In the opening of his essay he says, "The difficulty seems to be, not so much that we publish unduly in view of the extent and variety of present-day interests, but rather that publication has been extended far beyond our present ability to make real use of the record."<sup>5</sup> He goes on in the rest of the essay to imagine a number of technological developments in terms of the technologies available at the time that would help scientists and scholars do their work more efficiently and indirectly help scientists contribute to peaceful objectives after a war during which they helped build "destructive gadgets".

Nelson, by contrast, has a more grandiose view of the value of a hypertext system. On the cover of *Literary Machines* he writes:

THIS BOOK DESCRIBES THE LEGENDARY AND DARING  
**PROJECT XANADU**, AN INITIATIVE TOWARD  
AN INSTANTANEOUS ELECTRONIC LITERATURE;  
the most audacious and specific plan for knowledge, freedom and a better  
world  
yet to come out of computerdom; the original (and perhaps the ultimate)  
HYPERTEXT SYSTEM.  
DO NOT CONFUSE THIS WITH ANY OTHER COMPUTER BOOK.

For Nelson Xanadu is not just a way of making scholars more efficient, it is a "worldwide publishing system" that will allow the "equitable coexistence of many viewpoints" and "A vessel for the true shape of information -- without having to cut it or jam it."<sup>6</sup> He has a whole chapter in *Literary Machines* entitled "Freedom in Our Time and Beyond" that among other things predicts that electronic freedoms will be at "the center of the whirlwind of the coming years".<sup>7</sup>

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<sup>5</sup> Bush, "As We May Think", p. 89. All the page numbers for the Bush article are for the retrospective volume edited by Nyce and Kahn, *From Memex to Hypertext*.

<sup>6</sup> Nelson, *Literary Machines*, p. 3/2.

<sup>7</sup> Nelson, *Literary Machines*, p. 3/22.

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Another related difference between Bush and Nelson lies in the implementation of the hypertext vision. The device the Bush imagines, the Memex, was a desk that could store information on microfilm, could add new images easily and could connect notes and pages of information with links into associative trails that match how the human mind "operates by association."<sup>8</sup> The Memex was thus a personal hypertext system that was designed to keep large amounts of information and to allow the user to link the information according to associations that imitated the way they thought. While Bush imagined being able to save trails of links and their nodes of information and being able to then exchange those trails with others he did not imagine a networked hypertext system that would allow many users to both read, write, and link to each others information automatically. Thus Bush's vision is more about personal productivity in and from the research community while Nelson's is for a worldwide web of information to free us. Nor did Bush, of course, see how computers could be used to implement this rather than dry photography and microfilm.

The WWW's success compared to earlier computer-based hypertext systems is due in part to the fact that it was the first open and easy to use networked hypertext system. Nelson was right. While personal hypertext systems such as Hypercard or Guide existed before the WWW, they tended to be personal hypertext systems that were not designed to encourage a cooperative docuverse of shared information the way the WWW was. The WWW is still limited compared to Nelson's vision, and it is interesting to note where it does not live up to Xanadu. First of all, it has a very impoverished linking mechanism of uni-directional links compared to the rich set of links Nelson imagined, including transclusion where a node can be included within another seamlessly like a quotation. Second, the WWW doesn't have the royalty scheme that Nelson imagined, and the lack of a billing system is one of the things people generally feel is needed to unleash commercial use of the WWW for shopping. I can't help thinking this lack is a good thing. Third, the WWW does not save the history of documents which leads to broken links as

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<sup>8</sup> Bush, "As We May Think", p. 101.

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WWW sites vanish or the materials linked to get updated. This means most links have to be revisited regularly in order to be maintained.

What does Diderot have to do with this? Why would we want to turn back a quarter millenium to recover the thoughts of Diderot on a technology that has only existed for a few decades? The main reason is to recover an important moment in the history of the imagination of how information can be structured and connected. The hypertext link is not a late-20<sup>th</sup> century invention nor is the idea of structuring information into a series of nodes connected by references. To get a better sense of the history of imaginative attempts to structure information there is no better place to turn than Diderot's *Encyclopédie* which I will try to show incorporated many of the ideas that are implemented in computer-based hypertext systems like the WWW.

Diderot in his article on "The Encyclopedia" which was first published in 1755 writes that, "This word signifies *unity of knowledge* (enchainement de connaissance)".<sup>9</sup> He goes on to write that "In truth, the aim of an *encyclopedia* is to collect all the knowledge that now lies scattered over the face of the earth, to make known its general structure to the men among who we live, and to transmit it to those who will come after us, in order that the labors of past ages may be useful to the ages to come, that our grandsons, as they become better educated, may at the same time become more virtuous and more happy..." In other words he sets out on a project not unlike Nelson's vision of a Xanadu docuverse that can span the globe and liberate us from ignorance. The hype in Nelson which seems so naïve today has its origins in enlightenment projects like the *Encyclopédie*. There is a common belief that a network or chain of knowledge is the best way to collect information and transmit it to others and that that transmission will free us.

A second feature of Diderot's vision is that the work is to be authored not by a particular person, but by a "society of men of letters and skilled workmen, each working separately on his own part, but all bound together solely by their zeal for the best interests of the

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<sup>9</sup> Diderot, "The Encyclopedia", p. 277. All translations of this article are taken from Barzun and Bowen, *Rameau's Nephew and Other Works*.

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human race and a feeling of mutual good will."<sup>10</sup> He takes particular care to stress the authorship of the work, both by putting the phrase "society of men" in the subtitle of the *Encyclopédie* and in the opening pages of his article on the subject. This was in part to counter criticisms made after the publication of the *Prospectus* to the effect that no single person could be an authority on all the subjects to be covered, but also to stress a vision of cooperative intellectual work he inherited from Francis Bacon where likeminded men of letters could cooperate in the production of larger structured intellectual works. Where Bacon failed in his attempt to create an encyclopedia, Diderot succeeded in what may be one of the most influential multi-authored projects of the enlightenment.

To be fair, Diderot had in mind a project by *philosophes* like himself and edited by himself and D'Alembert. Nelson's vision takes the issue of authorship further and extends it to an post-modern networked docuverse where anyone can participate and express their views through connections to others. Diderot's circling of knowledge is an intentional one implemented by people of mutual good will and designed to be finished within a lifetime. Nelson's vision is of a free-market project without timelines or editors that is based on a view that intellectual freedom depends on opening such a publication system up to all people, even those who are not mutual in their good will. To some extent the evolution of the WWW has followed the progression from Diderot's view to Nelson's. It began as a cozy academic hypertext with mostly technical documents by colleagues and has evolved into something where commercial interests, extremists, and pornographers present what can only generously be called alternative viewpoints. Attempts to tame the WWW abound whether through legislation, further standards, or better editing, but these attempts seem doomed by the exponential growth of the WWW and the libertarian views of organizations like the Electronic Frontier Foundation. What Diderot would have to say about the WWW and its chaotic web of information by experts, amateurs, and peddlers is speculation, but given the breadth of his interests and his experience with censorship the chaotic WWW might have suited him.

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<sup>10</sup> Diderot, "The Encyclopedia", p. 283.

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The relevance of Diderot's encyclopedic project to hypertext design is not, however, limited to broad generalizations about intellectual publishing. Diderot outlines in his article on the encyclopedia, as does D'Alembert in the *Preliminary Discourse*, a mechanism of cross-references or *renvois* that are designed to tie the alphabetically organized articles into a more coherent structure or unity of knowledge.

D'Alembert in the *Preliminary Discourse*, which undoubtedly was written with input from Diderot, especially since it contained his *Prospectus* as its third part, distinguished the two aims of the work according to the two parts of the title (*Encyclopédie, ou Dictionnaire raisonné des sciences, des arts et des métiers, par une société de gens de lettres*). As a "reasoned dictionary" it was to contain the principles and basic facts of each science, art and craft. As an "encyclopedia" its aim was "to set forth as well as possible the order and connection of the parts of human knowledge."<sup>11</sup> These aims were achieved in two ways, first by identifying where each article belongs in the tree of knowledge that D'Alembert works out in a Cartesian fashion in the *Preliminary Discourse* and secondly by connecting articles through links to other articles. The alphabetical order of the series of articles is thus supplemented by an intellectual structure built around a logically developed hierarchy of knowledge and a tissue of connecting links some of which are related to the hierarchy and some not, as we will see in a moment.

While D'Alembert makes much of the hierarchy of knowledge which makes the work a reasoned dictionary, Diderot stresses that the looser structure of *renvois* as more important to the encyclopedic nature of the work. He says, that the cross-references are "the most important part of our encyclopedic scheme, ..." <sup>12</sup> in his article on the encyclopedia and devotes a number of paragraphs to discussing the uses of these links. Here is concatenation of some of the points he makes about cross-references,

They also put added stress on elements of internal consistency within groups of facts, they elaborate upon the connections that each special branch of knowledge has with its parent tree, and they give to the whole

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<sup>11</sup> D'Alembert, *Preliminary Discourse to the Encyclopedia of Diderot*, p. 4.



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Encyclopedia that unity so favorable to the establishment of truth and to its propagation. Moreover, whenever the occasion demands, they will also lend themselves to a contrasting purpose - they will confront one theory with a contrary one, they will show how some principles conflict with others, they will attack, undermine and secretly overthrow certain ridiculous opinions which no one would dare to oppose openly. ...

Finally, there is a kind of cross reference - it can refer either to words or to things - which I should like to call satirical or epigrammatic.<sup>13</sup>

What stands out about Diderot's discussion of links is that he sees them not only as references for purposes of definition where one refers a reader to articles that elucidate a term or discuss more general principles, but he also sees them as serving to create new meaning through contrasts or satirical links. The link as discussed by Diderot becomes more than a way of overcoming the alphabetic organization of the whole (a way of organizing articles which was still in question at the time); it becomes a way of creating trails of articles that convey something more than the sum of the articles. It should be noted as Bernard Ludwig points out in "L'utilisation des renvois dan la lecture de l'encyclopédie" that the actual use of links does not live up to Diderot's dreams for them.

This is the point of hypertext. As long as links are used merely to connect the general to the particular or to define terms they are a way of organizing information, not of creating new information. In Diderot we read approximately 250 years before the birth of the WWW the realization that new meaning can be created out of connections between nodes of existing information. In Diderot's project we have four of the most important features to Nelson's vision.

1. The creation of structured information by a **society of people**. Though Diderot did not go so far as Nelson when it comes to allowing anyone to participate in this society, his

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<sup>12</sup> Diderot, "The Encyclopedia", p. 295.

<sup>13</sup> Diderot, "The Encyclopedia", p. 295-6.

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Encyclopedia set the stage for such large collaborative projects that makes their usefulness obvious to us now.

2. The publication of **non-sequential information** implemented as **nodes** or articles connected by **links**. Diderot's is not the first dictionary or encyclopedia, but it was one of the most influential. If we are able to understand the usefulness of hypertext systems today as encyclopedic organizations of knowledge it is in part due to Diderot's work creating and discussing one. It is not surprising that one of the few areas where sales of hypertexts have surpassed those of printed equivalents is in the area of encyclopedias.

3. The use of links for more than organizational purposes **to construct meaning**. While Diderot was not the first editor to use cross-references he may have been the first to discuss explicitly their use for the creation of meaning. More generally, his discussion of both the encyclopedia as a project and the cross-references as an important part of that project connects the link as a hermeneutically important feature of the hypertext encyclopedia.

4. The separation of the intellectual structure of a work from its material organization. In the case of the *l'Encyclopédie* the material organization is the alphabetical arrangement of articles. In a computer-based hypertext it is the organization of nodes in a database on digital media. The point is that the way information is organized materially for ease of mechanical access can be separated and supplemented by intellectual arrangements that suit the aims of the authors and readers. Thus the logical hierarchy developed in D'Alembert's *Preliminary Discourse* and the web of links in the articles overcome the limitations of putting articles in an order that has nothing to do with their content. This separation makes it obvious why encyclopedias were one of the first types of printed documents to be systematically converted to computer-based hypertexts through the substitution of one mechanical arrangement for another.

To conclude I want to mention another work by Diderot that takes these ideas further by providing us with an image of consciousness which has hypertextual features and that work is *D'Alembert's Dream*. This fascinating and bizarre dialogue has three parts. In the

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first D'Alembert and Diderot have a short discussion about the existence of an omnipresent Supreme Being and consciousness. In this part Diderot advances a theory of consciousness to which I will return in a moment, and ends by warning D'Alembert that he is going to dream about the conversation. Sure enough in the second part of the dialogue Mademoiselle de l'Espinasse (D'Alembert's friend and patron) calls a doctor Bordeu because she is worried about D'Alembert's nighttime raving. While D'Alembert continues to sleep Mlle De L'Espinasse updates Bordeu from her notes on what D'Alembert has been saying in his sleep about consciousness and they take off from that to extend the discussion. D'Alembert eventually wakes up and participates and eventually the doctor leaves. The third part of the dialogue is a sequel where the doctor comes back after an appointment and continues the discussion with only Mlle De L'Espinasse as D'Alembert has left by that point.

While this is not the place to unravel this fascinating dialogue and its playful discussions of the place of sexuality, genetics and the mind, there is an image of consciousness that moves from the first discussion with Diderot to provide a thread to the rest of the dialogue. The character Diderot in the first part argues that the fibers of the conscious and sensitive mind can be compared to vibrating strings. "these vibrating strings have still another property - they can make other strings hum - so that in this way one idea can call forth another, the second can call forth a third, and so on. Hence no one can set a limit to the ideas that will occur to a philosopher, for his ideas arise out of their own necessary connections while he meditates in darkness and in silence."<sup>14</sup>

This image carries through D'Alembert's sleep-talking into Mlle De L'Espinasse's notes and her conversation with Dr. Bordeu. It is this image and related ones that animate, like the strings Diderot describes, the second part of the dialogue. It triggers Mlle De L'Espinasse to propose that the conscious mind is like a spider at the center of a web of

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<sup>14</sup> Diderot, "D'Alembert's Dream", p. 100. All translations of this dialogue are taken from Barzun and Bowen, *Rameau's Nephew and Other Works*.

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sensitive stings that are tweaked by the outside world, an image that Bordeu and Mlle De L'Espinasse extend and discuss in various ways.<sup>15</sup>

Diderot's art lies in not only using the dialogue as a vehicle to discuss this image of the mind and its ramifications, but in showing through the dramatic evolution of the dialogue how ideas put forth by his character might trigger similar ideas in others. The character Diderot starts the process with his musical image while the author leads us through the dream of D'Alembert into the conversation of Mlle De L'Espinasse and Dr. Bordeu. The dramatic structure is harmonized with the intellectual content. The thread of one conversation leads to another.

What is intriguing about this dialogue is that it provides an image of the mind as a web of connections comparable to a hypertext that in turn can trigger ideas in others. This comparison is not as far fetched as it might at first appear. Underlying hypertext theorists like Bush and Nelson is the epistemological view that the best way to model knowledge is not through a logical and linear exposition, but through a web of associations. As Nelson puts it in an article entitled "As We Will Think", "Writing is a process of making the tree of thought into a picket fence."<sup>16</sup> The excellence of hypertext is supposed to be its ability to approximate how the mind really works, which is, according to Bush, through associations. A hypertext is thus the best way to represent an experts knowledge or that of a society of intellectuals. A dialogue such as Diderot's is but one trail of associations through the combined knowledge of the participants.

While I think there are serious problems with this view of the mind and the proposition that the best way to represent it is through hypertext, Diderot's reverie is undoubtedly one of the more imaginative and suggestive presentations of what later writers on hypertext take for granted about the mind and knowledge. I leave you with the thought that Diderot could have presented his ideas in hypertext form having worked out a structure for *l'Encyclopédie*, but chose the dialogue form. Perhaps there is more to the mind and the art

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<sup>15</sup> Diderot, "D'Alembert's Dream", p. 125.

<sup>16</sup> Nelson, "As We Will Think", found in Nyce and Kahn, *From Memex to Hypertext*, p. 254.

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of the linear dialogue as a means of presenting the threads of ideas than hypertext theorists like Nelson think. I certainly think it fair to say that much of what we are rediscovering about hypertext and the relation between the organization of knowledge within the mind and the way it is published has been covered by Diderot, his encyclopedic project and playful dialogue on consciousness.

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