



**The intricate web: network and rhizome metaphors in
hypertext and the web and the problem of fake news**

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3 **The intricate web: network and rhizome metaphors in hypertext and the web and the epistemic**
4 **challenge of fake news**
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7 **Purpose:** This article analyses the structure of hypertext and the World Wide Web through the
8 contrasting metaphors of the network and the rhizome and applies that analysis to the epistemic
9 challenge presented by fake news.
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13 **Design:** The paper is a critical and theoretical study of the development of concepts in Information
14 Science. It outlines the limitations of the network metaphor and analyses the ways in which it has
15 influenced both the development and critical understanding of the World Wide Web and its wider
16 social and cultural consequences. The paper develops an alternative description of the ontological
17 structure of the Web in terms of interrupted and dissipated energy flows.
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22 **Findings:** The paper argues that the Web is better described as a dynamic reorganization of the socio-
23 cultural system that has no determinate boundaries, and which is constituted properly in the spaces
24 between technologies, and the spaces between persons.
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28 **Originality:** The paper contributes to and extends research into the rhizomic nature of hypertext and
29 the Word Wide Web, and in understanding the role of metaphor in descriptions of hypertext and the
30 web.
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34 **Keywords:** Rhizomes, hypertext, World Wide Web, Memex, fake news, disinformation
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3 This paper analyses the **structure** of hypertext and the World Wide Web through the contrasting
4 metaphors of the network and the rhizome and applies this to the problem of fake news. Since its
5 inception hypertext has been framed by network metaphors of various kinds including webs, meshes,
6 mazes, and cross-tangles. These metaphors **frequently** contrast analytical **approaches to information**
7 **organization** associated with formal classification and indexing. **They also imply tacit assumptions**
8 **about the underlying nature of information and its relationship to knowledge.** This paper analyses the
9 function of these metaphors through the **foundational** discourse of hypertext and the web and
10 explores the alternative metaphor of the rhizome. It argues that the social and cultural effects of
11 hypertext and the web emerge as consequences of asymmetrical, interrupted and dissipated flows of
12 information which both resemble and can be **better** described by the complex self-organization of the
13 rhizome.
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22 **The paper is divided into four parts. It first traces the emergence of network metaphors in the**
23 **foundational discourse of hypertext and the World Wide Web, defined as the works that most directly**
24 **influenced their development. It then addresses the limitations of the network metaphor and explores**
25 **its underlying epistemological assumptions. The third part outlines the metaphor of the rhizome and**
26 **explores its application to hypertext and the web. The final part applies this analysis to a discussion of**
27 **fake news and misinformation. This research has relevance to academic debates around the history**
28 **and theory of hypertext and the web, but also to the development of practical approaches to better**
29 **manage and regulate web content.**
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40 **A Brief history of the Network Metaphor**

41 The network **as a metaphor for hypertext and the Web** has its origins in Vannevar Bush's description
42 of the Memex, appearing first in the unpublished essay *Mechanization and the Record* later expanded
43 in the **better known** *As We May Think* (1945). The Memex was a conceptual machine intended to
44 address the limitations of existing manual information storage and retrieval systems and has often
45 been cited as the first example of a hypertext-like system. It was proposed as a solution to the
46 **apparently** precarious state of scientific knowledge **in the mid-century period.** Both rapid growth in
47 publishing and increasing **scientific** specialization had threatened to inhibit progress (Bush, 1945).
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54 Concerns of this kind were not unique to the time; Blair (2011) for example has explored the impact
55 of information overload in the ancient, medieval and early modern ages. Nevertheless, by the the
56 early twentieth century the over-abundance of information had become known as 'the library
57 problem' and a little later 'the information problem' (Burke, 1994). In an influential work of the period,
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3 Rider conjectured that 'it might almost seem as though some natural law were at work.' (1944: 16). A
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5 few years earlier Seidell had suggested that 'the number of journals and other documents is now so
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7 heterogeneous that [...] it is now practically impossible to obtain and consult all original published
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9 articles on a given subject' (1934: 70). A little after, Perry worried that:

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11 There now exists very real danger that a new observation or discovery in the laboratory, once
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13 made and recorded, may easily become lost — not in the absolute sense, but by disappearing
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15 into large accumulations of records and thereby becoming so difficult to find as to be virtually
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17 inaccessible (Perry, 1950).

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19 While the information problem was widely perceived as a significant threat to scientific and
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21 technological progress, it also had epistemological dimensions, drawing into question what could be
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23 said about the status of human knowledge. Two key ideas of the period highlighted this tension: H. G.
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25 Wells' World Brain and Paul Otlet's monographic principle¹.

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27 Wells addressed the problem of information on multiple occasions through the 1930s. In a in talk to
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29 the Royal Institution he had highlighted the 'conspicuous ineffectiveness of modern knowledge' (1936)
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31 and sought a means 'to hold men's minds together in something like a common interpretation of
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33 reality' (1936). The following year he expanded on this, lamenting difficulties in both 'the assembling
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35 and the distribution of knowledge' (1937) and developing the idea of a universal encyclopedia or
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37 World Brain. Like others, Wells looked to microphotography as a solution to the information problem;
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39 In the five years after 1936 some 450 papers had been published on microphotography in the library
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41 literature (Paine, 1942). But Wells also emphasized the importance of traditional indexing,
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43 classification and bibliographic control, writing that few 'know how manageable well-ordered facts
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45 can be made [...] once they have been put in place in a well-ordered scheme of reference and
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47 reproduction' (1937). It is clear from his work that the World Brain was rooted in analytical principles,
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49 characterized by disaggregating complex phenomena into their constituent elements, and in the belief
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51 in a shared underlying reality. But in emphasizing the conspicuous ineffectiveness of modern
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53 knowledge Wells also highlighted how those traditional assumptions were struggling to be contained
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55 by the proliferation of information.

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57 At around the same time Paul Otlet developed a similar understanding of the problem of information.
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59 The monographic principle was based on breaking-down texts into their constituent elements each of
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which would be stored on individually classified index cards, enabling their reconfiguration and rapid

¹ Both World Brain and the Monographic Principle are sometimes cited as precursors to the World Wide Web and hypertext respectively. However there is no evidence of a direct influence of these ideas on subsequent developments.

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3 retrieval in different contexts (Rayward, 1993; 2003). Otlet believed that dividing written records in
4 this way 'according to the genus and species appropriate to each element' did not result any
5 fundamental loss (Otlet, 1891–1892: 17, cited by Van den Heuval and Rayward, 2011); their meaning
6 was reducible to the meanings of their individual parts (Ducheyne, 2009). The monographic principle
7 along with the analytico-synthetic classification it employed emphasised both analysis and synthesis
8 as 'important operations in knowledge production' (Van den Heuvel & Rayward, 2011). However its
9 synthetic recombinations were rooted in prior analytical processes that took for granted the
10 underlying structure of knowledge. As Ducheyne notes, 'In the Otletian framework there was a rigid
11 correspondence between knowledge and reality' (2009). Both the World Brain and the monographic
12 principle therefore relied on analytical assumptions that reflected a shared underlying reality, but both
13 also exemplified how these principles were already problematized by the proliferation of information.

22 Vannevar Bush understood the problems of information discovery very differently. Far from rendering
23 the multitudinous well-ordered facts of modernity more manageable, analytical approaches
24 themselves contributed to the information problem, inhibiting information discovery and
25 exacerbating the consequences of growing scientific publication. Bush argued that 'our ineptitude in
26 getting at the record is largely caused by the artificiality of systems of indexing' (1945); their
27 'artificiality' explicitly situated such analytical frameworks as conceptual systems imposed upon
28 information rather than derived from and reflecting its fundamental qualities. Bush also described the
29 practical difficulties this created, writing:

36 Information is found (when it is) by tracing it down from subclass to subclass. It can be in only
37 one place, unless duplicates are used; one has to have rules as to which path will locate it, and
38 the rules are cumbersome (1945).

41 His solution was the Memex, which relied on what Bush described as 'associative indexing' (1945): the
42 contextual linking of records via meaningful associations (1945). Inspired by the tangled filaments of
43 vacuum tubes, the Memex weaved microphotographic records into complex new relationships, linking
44 information through constantly reorganized meaningful connections that allowed 'selection by
45 association' (1945). Where individual records resided was unimportant; inside the Memex it was
46 'exactly as though the physical items had been gathered together from widely separated sources and
47 bound together to form a new book' (Bush, 1945). Items were brought together not because they
48 shared a classification in an abstract scheme of knowledge, but because they were meaningfully
49 related within the immediate contexts of their use; for Bush 'the process of tying two items together
50 is the important thing' (1945).
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3 This proved to be a powerful idea with far-reaching consequences, but one that Bush struggled to fully
4 articulate. The 'spider web' of vacuum tube filaments suggested the 'mesh of associative trails' and
5 the 'intricate web' of the Memex machine itself (Bush, 1945). These images highlighted the reticulated
6 structure of the Memex, but they also implied its epistemological reach. For Bush, encountering the
7 products of human knowledge was akin to threading through a maze (1945); the Memex merely
8 modelled the innate complex structure of knowledge. By design therefore the Memex corresponded
9 to a basically synthetic and combinatory conception of knowledge that contrasted the analytical
10 assumptions of Wells and Ottlet and dispensed with the need to analyze texts into their constituent
11 meanings. The inchoate metaphor of the intricate web laid foundations not only for a new kind
12 machine, but for a novel way of framing recorded knowledge that became more fully realized in the
13 subsequent foundational discourse of hypertext and the web.

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15 A key figure in the transmission of this idea was Ted Nelson who in parallel with Doug Engelbart
16 (particularly: 1962, 1963) weaved the threads of the Memex into Hypertext, drawing out implications
17 that Bush left unarticulated². Nelson shared Bush's mistrust of analytical indexing and classification
18 and stressed their arbitrary nature, arguing that 'any hierarchies we find are interesting accidents'
19 (Nelson, 1974: 45). Hypertext by contrast promised 'total freedom from arbitrary categorizing' (Nelson,
20 1974: 51); like 'artificial', 'arbitrary' situated the categories of the analytical tradition as products of
21 the classification process rather than intrinsic properties of the things classified.

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23 Where the Memex had been seeded from practical problems, hypertext found root in political and
24 philosophical concerns. The radicalism of Nelson's outlook are well established; Kelly (2006) has
25 argued for example that hypertext 'originated as part of a liberational cultural and political movement
26 with aims that were as political as they were technical' and Castellucci (2022) describes Nelson as 'a
27 counter-culture Intellectual'. That radicalism was also implied by the aesthetics of his major work
28 addressing hypertext, *Computer Lib / Dream Machines*, with its magazine style, echoes of cut-up
29 literature, and allusions to the *Whole Earth Catalog*, hobbyist publications such as *Byte Magazine* and
30 *Creative Computing*, and the work of Marshall McLuhan. But the radical potential of hypertext was
31 most evident in the ways in which it challenged the epistemological categories underpinning post-
32 enlightenment modernity, and perhaps also the social institutions that maintain them.

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34 Nelson transformed Bush's images of spider webs, intricate webs, meshes and mazes into generalized
35 ontological principles, arguing for example that 'there are no 'subjects' at all; there is only all

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² Both Engelbart and Nelson reference Bush's work. Engelbart discussed the Memex at length in *Augmented Human Intellect* (1962); Nelson first cited it from the mid-1960s, and repeatedly referenced Bush in subsequent descriptions of hypertext.

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3 knowledge since the cross connections among the myriad topics of this world simply cannot be divided
4 up neatly' (1974: 45). Statements of this kind drew-out the epistemological implications of associative
5 indexing, *contesting the implicit assumptions in statements like Wells aspiration for 'a common*
6 *interpretation of reality' (1936)*. Nelson recognized this disruptive and democratizing potential of this,
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9 arguing:

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12 'Knowledge,' then - and indeed most of our civilization and what remains of those previous -
13 is a vasty cross-tangle of ideas and evidential materials, not a pyramid of truth. So that
14 preserving its structure, and improving its accessibility, is important to us all (Nelson, 1974:
15 87).
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18 While this does not amount to a coherent epistemological statement, it clearly questions the
19 foundation of human knowledge in established truths - the 'well-ordered facts' of Wells' World Brain
20 (1937) or the 'analytical facts' of Otlet (Ducheyne, 2009). Instead hypertext emphasized relational and
21 combinational conceptions of meaning and significance. Nevertheless because hypertext also
22 '*preserved*' its underlying structure, the *vasty cross-tangle of ideas* functioned too as a metaphor for
23 human knowledge. Both 'truth' and 'knowledge' were therefore explicitly contested concepts in
24 Nelson's work. The metaphors on which he drew were consequently messier than those of Bush;
25 spider webs, meshes and intricate webs describe *systematically* structured systems, but a vasty cross-
26 tangle describes a knot *resistant to both final description and institutional control*.
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34 If hypertext was born with a nod to post-war counterculture, the implementation within which it
35 *achieved* global reach drew it back toward both the pragmatic concerns of science administration in
36 which the Memex had been rooted. The World Wide Web was Berners-Lee's solution to the problems
37 managing information at the European Centre for Nuclear Research (CERN) in the mid-1980s (Berners-
38 Lee, 1999), reflecting *technocratic, rather than idealistic or radical, concerns*. Berners-Lee
39 incorporated into his description of the web aspects of the network metaphor drawn ultimately from
40 Bush (1945) and Nelson (1974; 1982; 1995; 2000)³, sharing their mistrust of analytical structures, and
41 suggesting that 'a 'web' of notes with links (like references) between them is far more useful than a
42 fixed hierarchical system' (1989). Like Bush he also reflected on the practical difficulties created by
43 analytic approaches to information organization:
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51 I had seen numerous developers arrive at CERN to tout systems that 'helped' people organise
52 information. [...] I saw one protagonist after another shot down in flames by indignant
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57 ³The influence of *As We May Think* on Berners-Lee's early work on the World Wide Web is unclear, however
58 by the mid-nineties he was acknowledging the parallels with the Memex, describing the web as 'quite a good
59 substitute for a MEMEX' (1995). Nelson is acknowledged in the original proposal for the Web (Berners-Lee,
60 1989).

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3 researchers because the developers were forcing them to reorganise their work to fit the
4 system (1999: 17)
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6 The web worked differently, growing out of use and reflecting the needs of its users. Berners-Lee
7 therefore emphasized its network structure, describing it as 'like a diagram of circles and arrows'
8 (Berners-Lee, 1989); this is a description of a directed graph, a form of network diagram. While
9 imposing a more systematic image on the Web, it also reintroduced hierarchy into the metaphor in
10 the implied precedence of the relationships between individual nodes.
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16 While the World Wide Web addressed a particular set of practical problems, it also incorporated
17 broader theoretical concerns. Allusions to self-organizing complexity appear throughout Berners-Lee's
18 writing on the web. In the original proposal Berners-Lee defined the problem as a 'loss of information
19 about complex evolving systems' (1989) and later describe hyperlinks as modelling the evolving state
20 of knowledge (Berners-Lee et al, 1992). He described CERN itself as 'a multiply connected 'web' whose
21 interconnections evolve with time' (1989), and later reflected on CERN's 'weblike structure' (1999:10)
22 and its 'complexity' (1999: 150). In a speech on the legacy of the Memex Berners-Lee stated 'the
23 behaviour of the whole is in some way dictated by the rules of behaviour of the parts' (1995). In self-
24 organizing complexity Berners-Lee also perhaps approached a vocabulary for describing the dynamic
25 fabric of hypertext.
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34 Complexity provided more than a vocabulary; it also provided a rationale for and justification of the
35 wider potential of hypertext systems. Yet in Berners-Lee's writing the relationship between the web
36 and complexity never transcended analogy. This is clear from the quasi-philosophical statements that
37 characterize Berners-Lee's later reflections. In *Weaving the Web*, he mused:
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43 In an extreme view, the world can be seen as only connections, nothing else [...] I liked the
44 idea that a piece of information is really defined only by what it's related to and how it is
45 related. There is really little else to meaning. The structure is everything (1999: 14)
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50 This is an audacious statement that weaves the web into a general philosophical ontology,
51 universalizing Bush's assertion that 'the process of tying two items together is the important thing'
52 (1945). It converges on a relativistic perspective that chimes with Nelson's earlier work while stripping
53 away its underlying political significance. Yet at the same time is it is vague and imprecise, failing to
54 unpack the implications that it evocatively suggests.
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3 The reality of the World Wide Web was ultimately more mundane. Far from only connections, the
4 web became largely independent files and databases. The web reproduced only the chunk-hypertext
5 of Nelson's vision, discarding stretchtexts, transclusions, and reciprocal hyperlinks as well as the
6 systems of micropayments and rights management integral to the Xanadu project (Nelson, 1995).
7 Nelson later argued that 'the web simulates paper' (Nelson, 2013a) and described it as 'precisely what
8 we were trying to PREVENT' (Nelson, 2013b). The web may stretch 'seamlessly from small personal
9 notes on the local workstation to large databases on other continents' (Berners-Lee *et al.*, 1992) but
10 it stretched figuratively across only the planar surface of the **directed graphs** Berners-Lee used to
11 explain his concept. Analytical classifications were re-imposed through search-engine indexes (cf. Hess,
12 2008) and through hierarchical navigation schemes; the implementation of directed hyperlinks
13 **encouraged** this imposition of hierarchical structure. In his pragmatic implementation of hypertext
14 Berners-Lee also tamed the implicit radicalism **associated with Nelson**.

25 26 27 **The limits of the network metaphor**

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29 Conceptual metaphors have rhetorical power: **they influence how we understand and act in the world.**
30 **Coward for example argues they imply ontological relationships and 'comprise an understanding of**
31 **what entities can or cannot do' (Coward, 2018). Perhaps the most significant account of this influence**
32 **is Lakoff and Johnson's *Metaphors We Live By* (1980), in which it is argued:**

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37 Our concepts structure what we perceive, how we get around the world, and how we relate
38 to other people. Our conceptual system thus plays a central role in defining our everyday
39 realities. If we are right in suggesting that our conceptual system is largely metaphorical, then
40 the way we think, what we experience, and what we do every day is very much a matter of
41 metaphor (1980: 3).

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43 The influence of metaphor on our everyday realities is arguably particularly true of the kinds of
44 metaphors that predominate in the **foundational** discourse of hypertext. Erickson has noted that
45 spatial metaphors 'can have remarkable effects on our perceptions' (2012: 912), and Boroditski that
46 such metaphors 'provide relational structure to an abstract domain' (2000: 1).

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48 The **foundational discourse of** hypertext and the web **is** replete with conceptual metaphors that
49 function to organize abstract ontological relationships in spatial terms: intricate webs, mazes, meshes,
50 cross-tangles, directed graphs, and networks⁴. Images of this kind marshal our understanding of the

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58 ⁴ There are of course other metaphors associated with hypertext and the World Wide Web. Van den Boomen
59 (2014) explores these and the role of metaphor in framing digital praxis.
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3 web and its effects while concealing largely unarticulated epistemological, ontological and social
4 implications. Those implications derive from an explicit rejection of analytical approaches to
5 organising information; Bush, Nelson and Berners-Lee each emphasized synthetic ideals that
6 sometimes appear to converge on unguarded relativism. While this is most obvious in Nelson's *vasty*
7 *cross-tangle* it is also evident in Berners-Lee's contention that 'there is little else to meaning'.
8 Nevertheless by reducing hypertext to its apparently fundamental constituents of nodes and
9 connections the network metaphor negates the influence of other possible considerations, and
10 imposes a reductive analytical framework onto a basically synthetic system of relationships. Network
11 metaphors of this kind therefore imply an already delimited description that constrain the web's
12 epistemological and social consequences. This section explores the limitations of that metaphor and
13 unpacks its tacit assumptions.

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23 Network metaphors imply non-hierarchical systems defined by relations of connectivity (Coward,
24 2018) in which the emphasis is on topology (Palumbo et al, 2006). They therefore generally emphasize
25 structure and surface over content. This emphasis is characteristic of the foundational discourse of
26 hypertext and the web: Bush stressed the 'the process of tying two items together' (1945), Nelson the
27 'vasty cross-tangle of ideas' (1974: 87) and Berners-Lee asserted that 'the structure is everything'
28 (1999: 14). The structure of hypertext is a product of the interrelationships between nodes, and
29 therefore the structural function of hyperlinks also tends to be foregrounded. Qualities including their
30 strength, distance, and reciprocity, along with the innumerable motivations for creating links are
31 reduced to the idea of the uniform connection, stripping hyperlinks of both their broader social and
32 cultural meanings and the contexts within which they are embedded. Weinberger makes this point
33 succinctly:

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There are so many different reasons one page refers to another: to dig further into the same
topic, to explore the topic more broadly, to explore a topic that's related but not the same, to
see an example of a site that doesn't understand the topic at all, to get further evidence that
what the page says is right, to propitiate an acquaintance, to get paid for running an ad
someone clicked on (Weinberger, 2008: 184)

By foregrounding its structural function the network metaphor silently elides these other
connotations of the hyperlink, and conceals their contribution to the hierarchies and clustering effects
that continue to play a role on the creation, dissemination and consumption of information and
knowledge across the web.

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3 Coward has argued that a correlate of the foregrounding of hyperlinks is a that 'nodes are understood
4 to have no substantive content [and] little analytic value' (Coward, 2018). The nodes of hypertext **are**
5 **subject to this lack of emphasis**. Qualities of documents such as **truthfulness**, accuracy, significance or
6 meaning are often reduced to **effects of** the associative relationships between texts, **such as for**
7 **example in link analysis techniques**. These characteristics do not of course lose significance in the
8 social practices of web use, but they are negated in the network metaphors that dominates their
9 ontological description. Van den Boomen has noted that the diagrammatic network metaphor
10 'suggests scientific truth' (2014: 180) and Erikson that 'reducing everything to a network [...] makes us
11 think we have been precise when we have been vague' (2012: 920). Something similar is true of the
12 network metaphors of hypertext and the web; their effect is to impose a systematic description
13 **connotating objectivity and precision** on a complex richly-interconnected system of information,
14 **meanings, and social practices**. The network metaphor **therefore elides** much that is humanly
15 meaningful about both the system that it describes and the relationships between its elements,
16 reducing **its material and social situatedness** to an abstraction stripped of **signifying practices - 'the**
17 **meaning-making behaviours in which people engage'** (Chandler & Munday, 2016). This abstraction of
18 a denser texture of meaningful relationships asserts an **epistemological reductionism - the**
19 **assumption that complex systems can be explained by reduction to their fundamental parts** - that
20 marginalizes both human agency and the wider **social situatedness of the web**.

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Such characteristics do not necessarily imply that network metaphors are inadequate to the
description of hypertext and the web for particular purposes. At particular scales the web is a
decentred and distributed, richly interlaced fabric of documents in which there are only connections
between otherwise undifferentiated nodes. **Yet generalizing out from this description implies that this**
is all that hypertext and the Web are. Van den Boomen notes that this far from exhausts the
description, observing the Web is:

...a network, of webservers, domain names, and sites, running by web protocols. Or, from
another perspective, the web is a network of HTML pages and data fragments connected by
hyperlinks. Or, on another level, the web is a network of visitors who favor some sites with
more traffic than others. Or, at yet another level, the web is a network of clustered
communities, connected by hyperlinks, issues and debates. Or, at yet another level, it is a
social network of people connected by strong or weak ties [...] but reiterating and nesting an
abstract term does not clarify its meaning (2014: 172).

This richer detail and structure **is** concealed by the abstract topology of the network, which silently
collapses the stratified nature of hypertext and web services **into a flat diagrammatic image**. It is not
only the density of their interconnection that differentiates major social media platforms, or major

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3 news publishers **from other content**, for example, but also connotations of source, significance,
4 platform and language, network effects emerging through use, consequences effects of unequal
5 global power relations, and the ways in which the connotations of hyperlinks themselves express value.
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7 In these regards the metaphor fails to exhaust the meaningful aspect of the socio-technological web.
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9 Far from being only connections the web is overburdened with meaningful signifying **structures**.

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13 The ruthless reductionism of the network metaphor becomes particularly apparent in the slippage
14 between the metaphor as description of hypertext, and as description of its effects. Bush's objection
15 to the 'artificiality of systems of indexing' for example was predicated on the assertion that 'the human
16 mind does not work that way. It operates by association' (Bush, 1945). This **idea** established an
17 **apparent link between** associative indexing and **cognition** that became a persist theme in the early
18 reception of the Memex. Hill (1946) for example **described how** the Memex might allow people to 're-
19 think' their own thoughts, and Tate (1947) **suggested** that it worked 'in precisely the same way that
20 the human brain picks up a relevant trail through the association of ideas'. The analogy was passed
21 down into the **foundational** discourse of hypertext. Nelson repeatedly associated hypertext with both
22 'the structures of ideas' (1974: 44) and with 'our thought processes' (1982: 16). Berners-Lee later
23 suggested associative indexing was able to 'mimic human association of ideas' (Berners-Lee *et al.*,
24 1992). Well into the twenty-first century, O'Reilly **was still insisting** that 'much as synapses form in the
25 brain [...] the web of connections grows organically as an output of the collective activity of all web
26 users' (2005). The complicity between the web and human cognition became a pervasive myth of
27 digital culture. Floridi describes it as a mimetic fallacy – **a false association implied by a superficial**
28 **similarity between two things that are otherwise unlike** - and has written:

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42 Even if the mind worked exclusively as a big associative engine, this would still be very far from
43 proving that therefore an information system, implementing the same logic, would
44 necessarily be any better than a linear system (1999: 127).

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47 Ellis suggests the association may be 'based on a rather naive concept of mind' (1992). It may well be,
48 but it is also based on a superficial correspondence between those metaphors used to describe
49 essentially independent systems. This exemplifies the ways in which the network metaphor both
50 produces and then negates its own effects: a **superficial correspondence creates an apparent**
51 **association that became the justification for associative indexing and was thus negated as an effect**.

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57 **A similar pattern is evident in the use of the web as a model for social organization**. The network
58 metaphor of social and cultural systems predates hypertext (Coward, 2018) but its wider adoption
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3 explicitly reflects the emergence of the information age. Ideas such as the network society (Castells,
4 2000), network identities (Fenwick, 2007), networked individualism (Raine & Wellman, 2012), and
5 network organizations (Snow *et al*, 2000) co-opt the metaphor within contexts sometimes only
6 tangentially inked to the **influence of the web itself**. Each implies a flattening of power within a richly
7 interlinked social and economic system, and relies on the apparent concordance between social and
8 economic systems and the **socio-economic effects of** the web. But as Van den Boomen notes,
9 ‘connecting people is not the same as connecting computers, no matter how strong the internet seems
10 to have achieved the blurring of these phenomena by compressing everything into an overarching
11 network frame’ (2014: 171). In a banal sense everything can be reduced to a network of relationships,
12 but by itself this has little explanatory power, and can only conceal the specificity of those
13 relationships **involved**. The rhetorical power of the network – **the ways they influence how we think**
14 **and act in the world** - comes from its **appeal** as a universal description, but that universality **also**
15 conceals the particular.

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26 **The network metaphor manages a final negation.** There are significant differences between both the
27 systems described by Bush, Berners-Lee and Nelson, and their underpinning assumptions. The Memex
28 addressed individual information needs in contrast to the universalizing tendencies of both hypertext
29 and the web. Nevertheless, Bush and Berners-Lee share a pragmatic focus on practical solutions in
30 contrast to Nelson’s *a priori* rejection of structure. The function of associative connections differs in
31 each case: Berners-Lee’s systems links documents, Nelson’s links text itself, transclusions functioning
32 like the weft of the text. Even the metaphors themselves sit uncomfortably: webs and meshes are
33 well-ordered systems whereas the vasty cross-tangle implies something more disordered. These are
34 synonymous ideas in only a superficial sense. The conflation of their differences conceals the
35 radicalism of Nelson’s hypertext and transforms the Memex and hypertext into incremental stages in
36 the development of a single idea culminating the in the World Wide Web itself, **implying an uneasy**
37 **teleology in the history of the web**. The intricate web of human associations with all its connotations
38 of creativity and subjectivity has been reduced to the network of documents and their hyperlinks.

39 40 41 42 43 44 45 46 47 48 49 50 **The rhizome-web**

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53 This paper argues that rhizome metaphors help describe characteristics of digital culture that are
54 otherwise difficult to analyze fully. They do this by emphasizing asymmetrical, interrupted and
55 dissipated information flows concealed by other network metaphors, what Deleuze and Guattari
56 describe as ‘the impasses, blockages, incipient taproots, or points of structuration’ (1987: 15). Such
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3 characteristics arise from the whole social process within which the network-web is integrated. **In this**
4 **section *network-web* is used to describe the characteristics of the web suggested by network**
5 **metaphors, and *rhizome-web* to describe those suggested by the metaphor of the rhizome.**
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10 The concept of the rhizome derives from Deleuze and Guattari's *Thousand Plateaus* (1987) and has
11 been frequently applied to descriptions of hypertext and the web (e.g., Burnett, 1993; Moulthrop,
12 1995; Calleja & Schwager 2004; Conley, 2009; Robinson & Maguire, 2010). Indeed Robinson and
13 Maguire suggest that 'the non-hierarchical and networked nature of the rhizome seem so closely
14 matched to the web environment that it is tempting almost to equate the two' (2010: 608). Calleja
15 and Schwager (2004: 7) argue that 'the hypertextual organization of the World Wide Web turns it into
16 an instantiation of the concept of the rhizome'. Moulthrop (1994) goes further, suggesting that
17 'Deleuze and Guattari's rhizome-book may itself be considered an incunabular hypertext.'
18 Nevertheless, these kinds of descriptions have tended to draw on the figurative image of the rhizome,
19 largely eschewing its philosophical contexts in the work of Deleuze and Guattari; **in doing so they risk**
20 **developing only a more abstruse version of the familiar network metaphor.** There is no doubt that the
21 figurative appeal of the rhizome is seductive, but that appeal helps conceal a **systematic** set of ideas
22 drawn from material science and philosophy that give the rhizome explanatory potential **lacked by**
23 **other network metaphors.**
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35 At first glance the structure of the rhizome appears similar to that of the network. Rhizomes are also
36 distributed, richly interconnected systems. Indeed, rhizomes are often glossed as decentred networks
37 (e.g. Smith & Protevi, 2018). However, Coyne notes that 'a rhizomic system is not necessarily the same
38 as a network system' (2008: 556) and adds:
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Whatever the strengths or weaknesses of the rhizome metaphor, and however it may become
entangled with the idea of the network, Deleuze and Guattari's agenda is against idealism,
empirical representationalism, political and social control, rampant bureaucracy, and
oppressive, hierarchical political structures. Networks also have a capacity to demonstrate
this radical ambition, but in ways that diminish the rhizomic metaphor (Coyne, 2008: 556)

53 The rhizome highlights aspects of the World Wide Web that are obscured by other network metaphors,
54 including its dynamic nature and integration within the socio-cultural system, and its epistemic reach.
55 **More importantly, by drawing philosophical ideas and material science the rhizome situates hypertext**
56 **as a material and technological instantiation of human culture. While the metaphor of the network**
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3 tends to collapse synthetic meanings and relationships into a reductive analytic framework the
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5 rhizome more fully embodies them.
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8 Deleuze and Guattari (1987: 5) contrast rhizomes with the well-ordered structure of the root-tree. The
9 tree is the image of the world, its root system the image of the canopy, and these connections are
10 established through mimesis (1987: 5). The tree and the root are organized by bifurcations, binary
11 division at which the branches and roots split into ever finer elements; in their terms it is *arborescent*
12 – defined by vertical hierarchies. The tree is a well-ordered system; it is also a description of the well-
13 ordered structures of human knowledge within the analytical tradition arising from its reliance on
14 reductionism, and classification. The rhizome, by comparison, is a constantly mutating mass of roots
15 or tendrils. It is colonizing and opportunistic, forging connections and internal structure as required.
16 It resembles Nelson's 'vast cross-tangle' (1974: 87), and there are obvious parallels between the
17 epistemological radicalism of Nelson's hypertext and that of the rhizome; both contest the foundation
18 of knowledge on established truths and a belief in the shared interpretation of reality. Unlike other
19 network metaphors the rhizome implies a living, evolving structure and its metaphorical value derives
20 from this organic nature capturing notions of change, and resisting final description. The rhizome is a
21 metaphor of untamed and mutable nature that contrasts both the carefully cultivated ideals of the
22 analytical tradition and the crystalline abstraction of the network.
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35 Nevertheless, despite their chaotic appearance rhizomes lack neither systematic structure nor
36 organizing principles; structure is an emergent property of local interaction. In describing rhizomes
37 Deleuze and Guattari draw on the characteristics of adaptive self-organizing complexity. This influence
38 is clear in their six principles for the rhizome (1987: 7-13). Like adaptive self-organizing systems,
39 rhizomes consist of innumerable elements exhibiting rich, non-linear and generally local interaction.
40 Those individual elements act independently, but while the evolution of the system is globally
41 unmotivated, adaptive complex systems nevertheless often appear to display purpose in their
42 emergent structure and behaviour. They are open systems, the boundaries of which are frequently
43 indistinct, and often a matter of particular descriptions at particular scales (see Manson, 2000). They
44 generally operate far from equilibrium, and therefore unfold in time. The whole is different from the
45 sum of its parts. (See also: Cilliers, 1998; Taylor, 2001; Manson, 2000). The rhizome metaphor
46 therefore models the self-organizing complexity of the web that Berners-Lee merely implied, and
47 thereby explains emergent properties arising from it, explicitly situating the web as a dynamic system
48 rather than a diagrammatic network.
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3 This apparent synthesis of rhizome and complexity has been unpacked by De Landa through several
4 works (1997; 2000). When applied to a description of hypertext it emphasizes the indiscrete
5 boundaries of the rhizome-web. **At one scale** the web is in Berners-Lee terms '*only connections*' (1999:
6 14) or in Deleuze and Guattari's '*only lines*' (1987: 23). The colonizing tendencies of the network
7 metaphor expose the network-web's indistinct boundaries but the metaphor nevertheless asserts
8 **characteristic** self-similarity. By contrast the rhizome-web exhibits characteristics of techno-cultural
9 hybridity; it 'ceaselessly establishes connections between semiotic chains' (Deleuze & Guattari,
10 8) both between individual hypertext documents and between those documents and the wider
11 cultural world. The rhizome metaphor therefore moves between the different scales of description
12 complicit with hypertext, its uses and effects, from cognition, through information system to society,
13 but without implying the **superficial mimetic** analogies associated with the network metaphor
14 **discussed above**.

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25 The rhizome-web is therefore a system not to organize the relationships between information
26 resources but one that **can be seen more clearly to** ceaselessly reorganize relationships across the
27 entire social system within which it is integrated, enabling semiotic chains that transcend the
28 boundaries of the different networks Van Den Boomen described above (2014: 71). This rhizome-web
29 encompasses the crystalline structure emphasized by Berners-Lee as an emergent property evident
30 only at particular scales of description. The network-web of hyperlinks and resources becomes **In**
31 **Deleuze and Guattari's terms** *a tracing* of the insipient taproots and blockages of this finer, denser
32 structure in which the richer meanings of both content and association are embedded. **The value of**
33 **the rhizome metaphor consists in this movement across scales and over time**.

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42 More importantly, relationships emphasised in the network model become complicit with the
43 multiplicity of the rhizome-web **in ways that overcomes the reductionism associated with the**
44 **network-web**; in Deleuze and Guattari's terms 'there are no points or positions in a rhizome, such as
45 those found in a structure, tree, or root. There are only lines.' (1987: 7). In this way the rhizome
46 emphasises the evolving **and** dynamic nature of both the web and the social context within which it is
47 instantiated. Rhizomes are systems that are defined over time; organization and structure emerge
48 fleetingly through the assemblages of *A Thousand Plateaus*:

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55 We will call an assemblage every constellation of singularities and traits deduced from the
56 flow—selected, organised, stratified—in such a way as to converge (consistency) artificially
57 and naturally (1987: 406).
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5 In contrast to networks Coward writes that ‘assemblage is not a tying together, but a putting into
6 contact. As such, the elements of the assemblage are understood as contiguous to one another, not
7 apart in the way that nodes are’ (2018). The emergent structure of the rhizome web – the
8 asymmetrical, interrupted and dissipated flows or Deleuze and Guattari’s ‘impasses, blockages,
9 incipient taproots, or points of structuration’ – can be understood as assemblages not of information
10 but in the reorganization of De Landa’s matter-energy – the material stuff of information in its various
11 forms all from cognition, through computation to documentation - within the social process in which
12 both the technological system of the web and the individuals are jointly implicated. These temporary
13 assemblages include for example viral memes, viral celebrity, fake news and misinformation,
14 conspiracy theories, and social media mobs, as well as every other aspect of the network-web. The
15 sudden points of structuration, explicable and analyzable only retrospectively, replete with political,
16 personal and pecuniary motivation and yet never fully reducible to them, are reflected in this organic
17 nature of the rhizome. They are the inevitable by-product of the intensification and complexification
18 of social connections made possible by the web.

30 **The rhizomic nature of disinformation**

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33 As well as providing an alternative description of the **structure of hypertext systems**, the rhizome can
34 be put to work to explain concrete effects of the web that are otherwise difficult to fully analyze and
35 understand. This final section illustrates this by applying the rhizome metaphor to the problem of
36 disinformation and fake news. This is not intended as a comprehensive theory of online
37 misinformation but as illustrative of the conceptual frameworks rhizomic metaphors mobilize.

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40 Fake news is generally understood as a form of ‘fabricated information that mimics news media
41 content in form but not in organizational process or intent’ (Lazer et al, 2018), as counterfeit news
42 (Fallis & Mathiesen, 2019), or as disinformation designed to be spread by social media (Rochin, 2017).
43 The practice of passing-off misinformation as news is central to most definitions and **implies**
44 intentionality; fake news exploits the aesthetic conventions of **news media** to conceal its origin, source,
45 or political significance. The problem of fake news is not new (Gelfert, 2018; Allcott & Gentzkow, 2017)
46 and fake news overlaps broader issues of disinformation and misinformation (Lazer et al, 2018).
47 Nevertheless online misinformation is widely **considered** to be a growing problem. The causes of fake
48 news and ideological polarization are disputed (Spohr, 2015) although it is **generally** agreed that
49 content curation and algorithmic filters play a part (e.g., Pariser, 2011; Rader and Grey, 2015). Fake
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3 news also has affective elements, appealing to emotions as well as reason (cf. Laybats & Tredinnick,
4 2015; Rochin, 2017), and therefore propagates in similar ways to clickbait and viral memes. Solutions
5 to the circulation of fake news generally focus on regulation and public education of consumers. Fake
6 news is therefore an easily recognized phenomenon whose subjective aspects make difficult to define,
7 regulate or eradicate. While associated with specific bad-faith actors including nation states, it
8 operates simultaneously at the levels of source, message, and reception and questions of
9 intentionality, content and interpretation play important roles at each of these levels respectively.

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11 Part of the problem in conceptualizing phenomena like fake news arises from the ways in which we
12 organize our understanding of information systems; misinformation thrives in those aspects of digital
13 praxis elided by the network metaphor, particularly questions of intention and interpretation.
14 Therefore, fake news is often reduced to questions of source-reliability and accuracy, emphasizing its
15 superficial characteristics over its integration into a rich, dynamic socio-cultural context. This reflects
16 the tendency discussed above for network metaphors to reduce richer social interaction to schematic
17 descriptions. The rhizome metaphor by contrast emphasizes semiotic chains that situate fake news as
18 complicit with the entire communication process within which they are embedded. From this
19 perspective fake news does not describe particular kinds of content with particular qualities reflecting
20 particular bad-faith intentions, but a function of the socio-technological processes in which content
21 emerges, is distributed, and consumed that has identifiable effects at every level, influencing
22 reception, undermining source, and disrupting the code. Misinformation is a problem of noise rather
23 than signal; the unauthorized and subversive appropriation of communications codes that run counter
24 to established uses. It is as noise rather than in its particular instantiations fake news challenges both
25 definition, and regulation.

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27 This becomes clear by applying the epistemic perspective rhizomic metaphors imply. Deleuze and
28 Guattari described the rhizome as 'an antimemory' (1987: 23) and note that 'short term memory
29 includes forgetting as a process' (1987: 17). The image of the root-tree described the ways in which
30 the analytical structures of modernity sought to stabilize knowledge within fixed relationships. In this
31 context misinformation is defined in its relationship to established truth, an aberrant twig of the root-
32 tree. The rhizome challenges these underlying assumptions in terms similar to Nelson's description of
33 human knowledge as 'a vasty cross-tangle of ideas and evidential materials' (Nelson, 1974: 87). Both
34 emphasize the contingency of truths and the social processes within which information and ideas are
35 embedded and from which truths emerge. Fake news exploits this contingency, emphasizing an
36 underlying epistemic uncertainty, and emerging only in its specific contextual instances.

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5 We can therefore read into fake news a phenomena that exploits connotations of source while also
6 exploiting the subjectivity of online propagation in which versions of truth are fundamentally always
7 already contested; online misinformation exploits the ambiguity between these two epistemic
8 positions, **an ambiguity** that arises precisely because network metaphor conceals the underlying
9 epistemological assumptions of hypertext and the web and connotes the 'scientific truth and
10 authority' **of an abstract diagram** (Van den Booman, 2014: 180). The intentional aspect of fake news
11 – that associated with specific bad actors – exploits doubt arising within the authorized code. This is
12 obvious because by exploiting the aesthetic and formal conventions associated with authoritative
13 sources, those intentional subversion of the code also inevitably undermine the connotations of
14 trustworthiness and erode the analytical assumptions underpinning public discourse. **But because it**
15 **consists in violations of authorized codes, attempts to regulate misinformation only threaten to force**
16 **those violations into new forms. Regulating fake news as particular kinds of content with particular**
17 **qualities and associated with particular platforms or intentional actors is therefore bound to fail.**

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28 The rhizome metaphor therefore suggests that misinformation is not a matter of establishing
29 'alternative facts'; while disinformation and misinformation can superficially be defined in respect of
30 received truths that description derives from the codes they appropriate. Fake news is not counter-
31 factual in its own terms because it neither establishes alternative truths nor seeks to. Misinformation
32 is generally temporary, fleeting, insubstantial and does not petrify into substantive or testable claims
33 of any real merit; it is a bringing-together of statements, contexts, and interpretations that has little
34 resonance beyond its self-limited context and operate wholly within that immediate social context as
35 rhetorical gesture. It exemplifies in other words the 'sudden points of structuration' within the
36 rhizome-web that however motivated are recognizable and analyzable only retrospectively. Fake
37 news co-opts and subvert the communications process, exacerbating epistemic uncertainty by
38 undermining all truth claims. The contemporary concern about misinformation therefore not only
39 echoes the information problem of the mid twentieth-century, but also exposes that anxiety as an
40 epistemological crisis in the validation of knowledge. Wells' aspiration 'to hold men's minds together
41 in something like a common interpretation of reality' (1936) can be interpreted as a plaint against the
42 consequences of Rider's 'natural law' (1944) of information proliferation. The practical solutions to
43 the information problem merely sublimate an anxiety that the noise of the information age – be that
44 fake news or the abundance of scientific publishing – threatens to overwhelm our ability to identify,
45 recognize and make sense of the products of the intellectual tradition.

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3 This does not automatically imply a turn to a post-truth discourse, or an abandonment of ideals of
4 truth, accuracy, and reliability; **the failures of the analytical tradition are only partial**. Misinformation,
5 disinformation and fake news do not **themselves** lay claim to epistemic uncertainty but appropriate
6 claims to truth that are underwritten by the analytical tradition, **albeit claims that are fundamentally**
7 **disingenuous. They pass themselves off as news; as established truths**. The rhizome-web exposes an
8 underlying rhizomic nature human interaction that was only momentarily petrified in the epistemic
9 assumptions of late modernity, **with its confidence in a well-ordered scheme of knowledge**. The very
10 anxiety to which the Memex responded - 'the conspicuous ineffectiveness of modern knowledge'
11 (Wells, 1936), 'our ineptitude in getting at the record' and 'the artificiality of systems of indexing'
12 (Bush, 1945) highlights that those assumptions were always inadequate. Nevertheless recognizing the
13 contingency of human knowledge **made explicit by the rhizome metaphor** does not imply there are
14 no criteria on which to choose between opposing ideas. It merely emphasizes both the social
15 processes through which judgements are made, and **their vulnerability to manipulation**.

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26 The network metaphor therefore over-emphasizes the characteristics of fake news in its specific
27 instances and under-emphasizes the processes through which these sudden but temporary points of
28 structuration come to be formed and come to inevitably dissipate. The circulation of misinformation
29 has a wide range of potential significances that go far beyond source credibility and content accuracy.
30 Embedded within specific social contexts, the sharing of content can function as a phatic utterance. It
31 can indicate membership of particular tribes, or social groups, and markers of social standing, political
32 beliefs, or cultural affiliations. The sharing of fake news can be indicative of status or of the possession
33 of privileged information. It can be indicative of boredom or inattention, the desire to provoke, or
34 outrage, be noticed, or to help others. The decision to share, like, subscribe or retweet are not univocal
35 statements but complex social interactions and social performances only fully explained within the
36 contexts in which they take place. **Just as** reducing the function of the hyperlink to a univocal gesture
37 flattens the richer ontology of the rhizome-web, reducing the sharing of misinformation to **simple**
38 intentions **flattens the complex and dynamic nature of these social interactions**.

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50 Fake news emerges and circulates within rich and complex social contexts **and cannot be fully**
51 **abstracted from those contexts**. Social media services are epitomes of techno-cultural assemblage –
52 not centralized services mediating social interaction, but a technologically-mediated clustering of
53 connections between people, a sudden but ultimately localized intensification of structure within the
54 wider rhizome-web, facilitated by but not synonymous with particular platforms. It is at these sudden
55 points of structuration that the rhizomic elements of the web become most obvious. The network
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3 metaphor implies that the technological system is a kind of 'inert receptacle for external forms' (De
4 Landa, 2000) of which disinformation is one problematic kind. The rhizome-web by contrast stresses
5 the social and material contexts in which disinformation is embedded. From this perspective fake news
6 is more easily recognized as a function of the dynamic interaction of social media assemblages;
7 gestures to persuade, inform, mislead, impress or entertain embedded within and dependent on
8 ongoing relationships of reciprocity and trust, less a matter of content than of establishing and
9 maintaining social relationships. It is an emergent phenomena of a complex system, and by implication
10 its root causes are systemic.
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18 The sudden points of structuration emerge out of the conglomeration of individual actions,
19 interpretations, and interests. The intensification of interconnection made possible by network
20 technologies and by hypertext structures has facilitated the emergence of new forms of social
21 organization, interaction and dependency, new social structures that exhibit a techno-cultural
22 hybridity. The very mutability of the sudden instances of structuration makes regulation of source and
23 content essentially impossible precisely because fake news and related phenomena exploit the
24 rhizome's tendency to 'ceaselessly establishes connections between semiotic chains' (Deleuze &
25 Guattari, 1987: 8). Addressing fake news is a matter of addressing the structural influences that enable
26 to concentration of information services in a handful of global companies and that create the feedback
27 loops that exacerbate the impact of highly visible content.
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37 Nevertheless misinformation and fake news also provide new opportunities for understanding the
38 social and political consequences of hypertext and the web. Considered as violations of the authorized
39 code, the intentional nature of fake news reveals information about the system within which it is
40 propagated. It implies the multifarious intentions underpinning disinformation in its varying points of
41 instantiation at source, message, and reception. Fake news and misinformation reveal the structural
42 weaknesses in public discourse and in the social consensus; those parts of public discourse where the
43 consequences of epistemic uncertainty is most evident. The affective element in the circulation of fake
44 news exposes the underlying tensions in public and political discourse, mapping onto those aspects of
45 contemporary beliefs and values that are most vulnerable to exploitation precisely because they
46 remain contested. It reveals the epistemic uncertainty that is characteristic of social interaction.
47 Rhizomic approaches to understanding the structure of hypertext and the web therefore open-up new
48 avenues of research in mapping what patterns of communication reveal about the underlying social
49 process within which information is created, circulated, and consumed.
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Conclusion

This article has analyzed the structure of hypertext and the World Wide Web through the contrasting metaphors of the network and the rhizome. Through its development the World Wide Web has been framed by network metaphors of various kinds. This paper has explored the ways in which these negate much that is of human significance about the ways in which we interact online, and conceal both the radicalism of hypertext, and the implicit epistemological assumptions that it implies. The paper develops an alternative description of the structure of the web in terms of interrupted and dissipated energy flows and argues that the web should be properly understood as a dynamic reorganization of the socio-cultural system that at its inception became associated with particular forms of technology, but which has no determinate boundaries, and which is constituted in the spaces between technologies, and between persons. **The potential significance of the new perspectives made possible by rhizomic structures includes new approaches to using misinformation to map patterns of communication and what they reveal about the social processes in which information is embedded.**

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