The Net Effect

Design, the rhizome, and complex philosophy

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> Networks keep appearing in design research. A consideration of networks brings us into contact with Deleuze and Guattari's concept of the rhizome. On the one hand their characterisation of the rhizome seems to be an extension and vindication of the application of the network. On the other hand it diminishes the authority of the network as providing a general account of social conditions, spatial configuration and design processes. In this paper we examine critically how both the network and the rhizome feature in major design legacies.

A network is a collection of interconnected entities. This simple definition belies a complex array of associations, passions, and ideologies that accords the network much of its authority.[i] The network has renewed currency in contemporary thinking about design, the computer, digital media, and the prevailing techno-social condition. In their seminal work, *The Network Nation*[ii], Hiltz and Turoff point to the extension of digital networks, satellite communications, and video transmission as a means of forming the world into a total communicative structure, a "global village."[iii] Writing at the end of the 1970s they identified this totalising network with a new opportunity to revive democracy, to enable people to communicate in a way that is open, free and that bypasses the encumbrances of class and ethnicity.[iv] They also align the network to human cognition. Electronic networks extend the mind, and engender opportunities for communication at the level of highly informed, unencumbered reason. More recent commentary introduces dynamism into the network theme. From a critical, social science perspective, Castells identifies the distinctive feature of the network society as "its ability to reconfigure, a decisive feature in a society characterized by constant change and organizational fluidity."[v]

The network has had a substantial presence in design research, including applications of systems theory, cybernetics and autopeisis that resort to networks of interconnected processes,[vi] the

interdependence between design disciplines,[vii] accounts of designing with non-linear text,[viii] and urban topologies.[ix] In considering the network and its authority we soon come up against Giles Deleuze (1925-1995) and Felix Guattari's (1930-) provocative and sometimes difficult theorising about the *rhizome*. Writing before the burgeoning of the Internet, Deleuze and Guattari posited the metaphor of the rhizome as a means of explaining language, text, and politics. A rhizomic system is a system of fibrous subterranean connections between plants, mostly weeds. It is an "acentered, nonhierarchical, nonsignifying system without a General and without an organizing memory or central automaton, defined solely by a circulation of states."[x] Theorists of computer culture, notably art and design theorists,[xi] have identified the richly interconnected, heterogeneous and somewhat anarchic aspect of the Internet as characterising a social condition that is rhizomic. Whereas the network notion often champions the cause of an idealised connectivity and unity in all things,[xii] Deluezian philosophy runs counter to an ideal of unifying connections and provokes an ethos of disconnection and fragmentation.[xiii]

The network serves as a description of a technical system, but it is also used to account for the wider social, cultural and political milieu. How has the network assumed this role? From what does its authority derive? An investigation of the authority of the network serves to position the network as one metaphor amongst many (for Deleuze and Guattari these metaphors include: constellation, galaxy, map, diagram, system, structure, machine, body, rhizome, plateau, parasite, disturbance, wastage, irritant). Furthermore, the concept of the rhizome presents as an attempt to undermine the authority of the network, from within.

The Platonic warp

Loosely-formed, egalitarian and liberal network structures are often contrasted with less desirable, autocratic, linear, sequential and ordered organisation. For some commentators, an appeal to the network society, or network processes, is ostensibly an appeal on the side of the indeterminate form of the pre-Socratic and Hegelian dialectic,[xiv] against logic. The socio-technical digital network is a complex, relational, trans-logical, cultural and social phenomenon, in which we participate in ways

that are liberating, consensual, and unconstrained by the predeterminations of logic.[xv] Society is formed as a complex series of conversations. Society and design and dialectical, as if constituted by a vast combination of conversational pairings in which truths and opinions are negotiated and propagated, as in a network.[xvi]

A quick reading of Deleuze and Guattari on the rhizome seems similarly to run counter to a view of reason based on rigid organisation, hierarchy and logic. A rhizomic system is dynamic and unresolved, growing and anarchic, in the manner of a rich and open-ended conversation.

But Deleuze and Guattari equate the dialectic with the beginnings of all manner of political excess, or ultimately oppression, and boredom: "One becomes two: whenever we encounter this formula … what we have before us is the most classical and well reflected, oldest and weariest kind of thought."[xvii] Their parody of the dialectic is of a bifurcation (rather than the synthesis or convergence of two positions). One thought becomes two, which commences a lineage of further subdivisions. For Deleuze and Guattari, dialectical thinking contains the seeds of a process they regard as tree-like, or arboreal.[xviii] Everything derives from the main trunk, and there is a hierarchy of dependence. Though concealed beneath the veneer of liberalism, it is a vertical process, overloaded with the trappings of authority, order and hierarchy.

If the arboreal has its seeds in the dialectic, there is ample evidence of its full growth in the legacy of Plato.[xix] Plato presented a picture of the universe that is hierarchical, ordered and counter to the spirit of the dialectic (even the liberal dialectic as approved by Hegel) and in accord with Deleuze and Guattari's derided arboreal model. Metaphors of Plato's ordered universe were developed vigorously by Plotinus.[xx] In this tradition, the universe is made up of a series of stages to enlightenment. What we encounter in the world of the senses is but a pale shadow of something beyond, that which transcends mortal existence. This philosophy appeals to hierarchy and order, a movement from the shadows to the light, the strictures of the body to the free flight of the soul. The city was to be so ordered. People know place. The philosopher king has greater access to the transcendent realm of the Intellect and is at the top of a social hierarchy. Those who pander to the common taste are of a lower

order. Of course, it is through Plato that we encounter the ideological: ideal geometries, states, moral conditions, the good and the beautiful. In terms of the topology of the network, the ideal assumes an initial unity, a trunk, from which everything else derives. Idealism and ideology are tree like.

Deleuze and Guattari further amplify the issue of the ideal in terms of Plato's conjecture about copying. For the Platonist everything is just a copy or representation of the original ideal. For the Platonist, representation is a tracing of the outline of something, an attempt at a one-to-one literal translation of an original in some medium or other, as if drawing an outline over a painting on tracing paper. To further deride the idealistic position, and its lack of participation in the realm of creative indeterminacy, Deleuze and Guattari assert that this "logic of tracing and reproduction"[xxi] is in fact "tree logic." The tree gives expression to a regime of tracings and puts them in a hierarchical order: "tracings are like the leaves of a tree."[xxii]

The closest Plato seems to come to an endorsement of the network metaphor is through the metaphor of weaving, but here there is also an appeal to bureaucratic order and control. We might think of a fabric as a network of loops and knots, overlays and connections. But here weaving subjects an understanding of the social condition (of the polis) to a formal frame, an intertwining of warp and woof,[xxiii] measuring and dividing, marrying together dissimilar natures: the courageous and the temperate, the bold and the gentle, which are the warp and the woof of society. There is the firm texture of the warp and the looser texture of the woof. Plato says that the beneficent ruler brings their life together in agreement and friendship and makes it common between them, completing the most magnificent and best of all fabrics and covering with it all the other inhabitants of cities, both slave and free.[xxiv]

The brave, loose, slightly rhizomic woof, becomes subjugated by the constraints of the warp. The Platonic network is not a loosely-woven anarchic structure, but a gridded fabric with its logic of binding, constraint, covering, hierarchy, striation and order.

The stoic connection

Whatever the hold of Platonic idealism now, Plato did not have exclusive rule over the ancient imagination as it pertains to the network. Contrary to Plato's philosophy of order and bifurcation was the philosophy of the Stoics. Stoicism was a philosophical movement that followed Plato's time. It was taken up by Roman writers, particularly Marcus Aurelius[xxv] and Seneca,[xxvi] and became the dominant philosophy of the Roman Empire, and arguably of Vitruvius,[xxvii] the first design theorist. For the Stoics there is no transcendent realm, invisible and superior to human existence. Rather, the universe itself, as experienced, has within it an organic character, through its inter-connectedness. The universe is a connected whole. This material whole is perhaps beyond comprehension, but it is constituted by what is, and nothing more. Our participation in the realm of the senses is participation in a larger whole, not an inferior participation. If we only knew our role in the larger web of connections, then the peculiarities of our own situation would make sense, for the whole is of greater import than the sum of the parts. The Stoical attitude, in which we endure suffering without complaint, gains its impetus from knowledge of the intricacy of the web of causal connections. If we only knew the whole of which our individual circumstance is a part, then any suffering we happen to encounter would make sense. In Stoical mode, Marcus Aurelius exhorts us to observe how

> all things are submitted to the single perceptivity of this one whole, all are moved by this single impulse, and all play their part in the causation of every event that happens. Remark the intricacy of the skein, the complexity of the web.[xxviii]

Here the network is not that of a fabric cast over society by order of a beneficent philosopher king (as suggested by Plato), but of the already extant character of all things to be connected in an organic unity. We and our world are not constituted as imperfect shadows cast through the fabric of a divinely stratified cosmic order, but participants in a larger, interconnected whole.[xxix]

Deleuze and Guattari also draw substantially on Stoicism.[xxx] According to Sellars, their organicism, their enthusiasm for naturalistic, rhizomic and geological metaphors is drawn from Stoic writing,

including Marcus Aurelius, for whom we are to "think of the universe as one living organism, with a single substance and a single soul."[xxxi] Their philosophy of the rhizome advances on the Stoical theme against transcendence. Classical philosophy (Plato) regards the process of distinguishing the universal from the particular as a major aspect of reason. A square is a universal category, of which there are myriad instances or particulars: square tables, square rooms, squareish handkerchiefs, badly drawn squares on scrap paper. Generalisation rapidly moves on to perfection. A square is not only a generalisation but a perfection that is never actually encountered. Then there is the question of where such perfect objects exist. Spatially, the transcendental idealist thinks of some realm transcending the world of the particular, a higher plane in the cosmos.

Universal networks

Lest we think that recourse to the Stoical network rescues us from idealism, it is necessary to reflect that networks are readily conscripted to the cause of universality. On the one had the network is a metaphor for the Stoical attitude (the web, a vastly extending array of causal interconnections). On the other hand the network advances a kind of idealism. This idealism operates through a technical construction of what a network is. Network topology can serve as a means of generalisation. In mathematical terminology a network is a type of graph.[xxxii] A graph is simply a set of nodes and their connecting links. The first mathematical formulation of graph theory is attributed to Leonhard Euler (1707-1783), who introduced the graph as a technique for analysing a particular class of problem. In his illustration of this technique he cites the case of the island at the fork in a river in the German city of Konigsberg. There are seven bridges across the river at various locations. The problem is to walk about the town such that you traverse each bridge once, and only once. As formulated, there is no such path possible. To discover that this is in fact the case the problem can be generalised as a graph, ie a network diagram, with the bridges as seven links and the banks of the river as four nodes. Many factors can be considered irrelevant in formulating the problem: the length of the journeys, orientation, width of the bridges, flow of the river, etc. It is also necessary to frame the problem in a way that treats the river banks as points or nodes, perhaps requiring a leap in thinking about the problem. This formulation leads to a simplification and a generalisation, a graph or network, and the

principles derived can be adapted and used in many situations.[xxxiii] The spatial relationships between objects, like river banks, bridges, roads and towns, or between rooms in a building, can be generalised as a graph with nodes and links. Such graphs can be classified and analysed, and facilitate various calculations. In terms of graph theory, a *network* is actually a "directed graph," a system of nodes and connections where there are directional flows along the links, as in a traffic system, electrical circuit or canal system.

At times it seems as though Deleuze and Guattari are railing against the properties of networks in general, what they characterise as "structures," as well as the hierarchical, arboreal organisations known as trees. In fact the tree structure decried by Deleuze and Guattari is a particular category of graph or network, where there are no loops.

The mathematical field of graph theory has many applications. It has been brought into play in systems theory, which seeks to generalise across diverse problem domains, from biology to engineering design.[xxxiv] For example, Steadman provides an elegant treatment of graph theory in the realm of architectural design and spatial topologies.[xxxv] A network can undoubtedly be used as a tool in this way, with much invention required to locate appropriate applications, but network discourse often extends to a consideration of the universal picture. Networks are taken as generalisations and can be represented as computer data and programs. If aspects of problems like the Konigsberg bridge problem can be so represented then these can be translated into computational form. Researchers in "artificial intelligence" have posited generalised "semantic networks," knowledge structures and models of cognition in such terms.[xxxvi] By a crude logic it is then a simple step to assert that computers can be made to "store" knowledge, and perhaps to "think." A further amplification of the authority of the network places the whole of human relations into computer networks.[xxxvii] If people form networks, and computers are linked in networks, and networks codify generalisations from the particular, and generalisations capture reason at its essence, then the ground is ready for the over-inflated authority of the network.

One does not need to be a transcendental techno-Platonist to believe in the value of generalisations, universals, and the utility of the network. Much logic and pragmatic calculation is founded on it. The network can be seen as a tool amongst others, but the authority of this overloading of the network is difficult to resist. Not surprisingly, Deleuze and Guattari rail against the application of networks as a globalising way of explaining all things, though for them it is just the error of tree-like thinking: the tree belongs to binary logic, and runs counter to the way thought operates. For Deleuze and Guattari: "Thought is not arborescent, and the brain is not a rooted or rarefied matter."[xxxviii]

The authority of the loop

A rhizomic system is not necessarily the same as a network system. Presumably a botanist could take the rhizomic arrangement of roots in grasses and talk of the transfer of nutrients in network terms. A graph theorist could look at the junctions between any cluster of rhizomes and make out a network topology. In fact it would most likely take on the form of a bifurcating tree structure.[xxxix] But Deleuze and Guattari's rhizome is after all a metaphor, the potency of which is diminished when reduced to a network, or shown to be dependent on it. 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. But perhaps Deleuze and Guattari are just talking of *complex* networks when they speak of social and political systems. Perhaps sociality is not a *simple* network, but a *complex* one. It is worth examining the notion of complexity before again examining the radicality of Deleuze and Guattari's formulation.

Networks have the capacity to become complicated.[xl] Connecting a few more links can alter the relationships of a network in complex ways. Networks can also become visually complicated. As we have seen, graph theory involves the study of graph configurations and their calculable properties. For example, it is possible to calculate whether a network has a "Euler path," ie whether it is possible to plot a continuous path that traverses every link in a particular graph once and once only.[xli] It may be

possible to determine this by visual inspection of a diagram of the network, and trying to draw in a few Euler paths. If the network has several dozen nodes then this method becomes less practical. But the simple formula derived by Euler applies whatever the size and configuration of the network, and could easily be calculated on a computer for a network of several thousand nodes. In this example we can see that large and visually complex networks can be comprehended, or at least calculated, through the methods of graph theory.

Part of the appeal of networks is their participation in this play between simplicity and complexity. The simple involves planarity, the complex is non-planar. Parts of networks can be simple as visual entities, but the combination of these simple components produces something complex. The behaviour of the part is comprehensible, calculable and can be drawn on a sheet of paper. The whole may be incomprehensible, involve very complex calculations and be impossible to represent. As the Stoics believed, if we could understand the whole, then we would appreciate our small part in it, and be content. Arguably, the network derives much of its authority from this capacity to maintain simplicity in the detail, while suggesting complexity in the whole.

A further component of network complexity is the nature of the loop. Deleuze and Guattari describe a rhizomic system as "defined solely by a circulation of states."[xlii] Networks suggest circulation, repeating, and looping. Euler's Konigsberg bridge problem involves tracing a circuit as a series of loops. When laid out as a diagram the links in a graph can be curved or straight. Sometimes it is clearer to represent the links as curves rather than straight lines, and this is how the Konigsberg network is commonly shown, further highlighting the looped character of the network.[xliii] In practical terms a network suggests flows, as in a road map, which suggests movement in one or both directions along the links, with intersections as nodes. Numbers on the links between nodes might represent the volume of traffic, speed, distance or resistance to flow. Graphs are not necessarily about movement, but networks generally are: the flow of people, traffic, data, signals.

By a metaphorical reading, the basic unit of the network is not the node or the link, but the loop. The Konigsberg bridge problem, as the prototypical network, is a problem of wending one's way *around* a town, in a series of loops. Impulses, signals, fluids, and traffic flow around networks. The language of

networks is that of the loop: flow, circuit, circulation, return, backtrack, movement around. The loop also features prominently in cybernetics and systems theory in the concept of feedback.[xliv] Causal complexity arises as soon as we allow that an event influences not only another event, but an effect returns to the initial event. The nutrients in the soil enable a tree to grow, which in turn sheds leaves that restore nutrients to the ground to enable the tree to grow. For the founder of systems theory, Ludwig von Bertalanffy (1901-1972), the primary regulation in organic systems is of dynamic interaction producing a state of equilibrium between organism and environment: "the living organism is an open system, maintaining itself in, or approaching a steady state." [xlv] The process is abetted by "fixed arrangements, especially of the feedback type."[xlvi]

To the contemporary, liberal mindset, loops, like networks, present as democratic, engaging, flexible, with indeterminate effects. In social life they suggest that pupils can influence teachers, voters influence politicians, consumers are active, and user practice and opinion informs design. Conversely, one-way directed graphs, or tree-shaped graphs, are autocratic, and deny the loop. In terms of graph theory a tree is a graph with no cycles. It would be like a road system where it is impossible to revisit a node (intersection) without doing a u-turn and traversing back the way you came, a type of looping to be sure, but one that goes against the flow, that is not abetted by the network configuration. Deleuze and Guattari's polemic against the tree also seems to be a polemic in support of the loop.

When theorists refer to the network of human relations, overlaid with networked information technologies, they commonly qualify them as *complex* networks. The network as a model of the complexity of human society, at its best is a looped structure. The reference to networks by social theorists and others is generally to complex networks. In formal terms these are networks where there are vast numbers of nodes, and the properties considered by graph theory are difficult to calculate, or are less relevant. Other properties take over.[xlvii]

Complex networks have been classified in terms of their behaviours. There are complex networks that are structured, random, symmetrically ordered, or disordered. There are maximally interconnected networks where every node is connected to every other node. Some nodes may be more highly

connected than others. Networks can exhibit clustering, where there are identifiable subnetworks with lots of tight connections and fewer connections to more distant nodes. There may also be phenomena that are exhibited by the whole of the network that are not apparent from the interaction of the parts, such as the propagation of patterns of activation in neural networks. In so far as we might think of social networks then presumably these have the properties of complex networks, and could be analysed in these terms.

We may suppose that the authority of the network here derives from two sources. Complex networks suggest structure, even if that structure is difficult or impossible to pin down. Simple networks have calculable properties. Larger networks inherit the authority and promise of their simpler prototypes. Complex networks are loose, democratic, dynamically formed, flexible, evade control, and have meta-properties exceeding the sum of their parts. If the universe is a network, then it is an exceedingly complex one.

The authority of the cut

One way of visualising, calculating and otherwise dealing with such complexity is through simplifications, hierarchies and levels.[xlviii] The city of Konigsberg as network has myriad nodes and connections, only some of which are considered in Euler's formulation. The whole city is reduced to four nodes and seven links, for the purposes of solving the circulation problem. Overlaid on this construction of any city are hundreds of others (transport, water and gas supply, drainage, commerce). In the manner of Calvino's invisible cities, any city can be construed as many layers of networks, of varying degrees of complexity, with disparate relationships between those networks.[xlix]

Networks can participate in various hierarchies pertaining to parts and subparts, less detail and greater detail, accurate and approximate. Networks have also been related to "meaning structures." Meaning is commonly thought to reside in relationships. A network representation of a city constitutes a basic underlying meaning structure, of which the spatial arrangement of roads, public spaces and buildings is just a surface manifestation or symptom.

But Deleuze and Guattari's project works against the authority of generalisation, and layers of meaning. Their avoidance of universals is well expressed in their assertion that there is "nothing above the line."[l] For Deleuze and Guattari there is no meaning greater than the parts, no higher level of meaning. Their objection to levels of meaning is in part directed against Chomsky's theory of deep structure in language,[li] and the project of structuralism, which looks for meaning in the relationships that underlie any cultural or linguistic phenomenon, as though there are hidden codes to be deciphered and interpreted. For Deleuze and Guattari "there is no overcoding with the rhizome."[lii] Their philosophy also runs counter to a systems-theoretical approach (Bertalanffy, Simon) which assumes underlying relationships, feedback loops, static, dynamic or otherwise. Deleuze and Guattari's project seeks alternative metaphors to those of levels, origins, derivations and meaning structures, against which they provocatively and enigmatically posit rhizomatics, schizoanalysis, stratoanalysis, pragmatics, and micropolitics. Of course, to appeal to a "concept," such as stratoanalysis, can be construed as participating in a "higher order" of meaning, but for Deleuze and Guattari such "concepts are lines, which is to say, number systems attached to a particular dimension of multiplicities (strata, molecular chains, lines of flight or rupture, circles of convergence, etc)."[liii] Structuralism claimed to posit a science of language, systems theory claims the status of a meta-science, but in heroic and anti-metaphysical mode, Deleuze and Guattari renounce any complicity with science: "We are no more familiar with scientificity than we are with ideology; all we know are assemblages."[liv]

In recognition of the power of the metaphor of layered meanings, and counter to it, they posit the concept of the plateau, which is "any multiplicity connected to other multiplicities by superficial underground stems in such a way as to form or extend a rhizome."[lv] In Stoic vein they align this plateau with the operations of nature, though perturbed through an ironic reference to a machine, and a machine of abstraction at that.

> The plane of consistency of Nature is like an immense Abstract Machine, … This plane has nothing to do with a form or a figure, nor with a design or a function. Its unity has nothing to do with a ground buried deep within things, nor with an end or a project in the mind of God.

Instead, it is a plane upon which everything is laid out, and which is like the intersection of all forms, the machine of all functions; its dimensions, however, increase with those of the multiplicities of individualities it cuts across.[lvi]

In the philosophy of the rhizome everything is surface. Theirs is also a philosophy of subversion. As Marx was not against capitalism, but saw within it the seeds of its own destruction, so Deleuze and Guattari's rhizome is parasitic on established structures. It grows from within to subvert the edifice. The trappings of bureaucracy and the keeping of accounts draw on the operations of a tree-like tracing, but creative subversion "can begin to burgeon nonetheless, throwing out rhizome stems, as in a Kafka novel."[lvii] Institutions are prone to disturbances to their own operations and authority, from within.

Networks, complex or otherwise, speak of flow, continuity, balance and stasis. Everything is connected in a way that is ultimately unified and whole. Deleuze and Guattari do not endorse network flows, other than those that are ill-formed and deviant: "A mutant flow always implies something tending to elude or escape the codes."[lviii] Their metaphor of the rhizome, supplemented by the machine, draws attention to a disruption in the flow, "*a system of interruptions* or breaks (*coupures*)."[lix] For Deleuze and Guattari

every machine functions as a break in the flow in relation to the machine to which it is connected, but at the same time it is also a flow itself, or the production of a flow, in relation to the machine connected to it.[lx]

The machine defies unity as a whole. Rather than a circuit or network it operates as a short circuit.

everything functions at the same time, but amidst hiatuses and ruptures, breakdowns and failures, stalling and short circuits, distances and fragmentations, within a sum that never succeeds in bringing its various parts together so as to form a whole.[lxi]

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As a further indication of their deviation from theories of complex networks, Deleuze and Guattari denigrate the role of the loop as a defining characteristic of the rhizome: "We are writing this book as a rhizome. ... We have given it a circular form, but only for laughs."[lxii]

Friedrich Nietzsche (1844-1900) posited the provocative notion of the "eternal return"[lxiii] as a defining aspect of human being, recognising the importance of repetition in human psychology, cycles of history, the persistence of the return in any journey, and as a feature of memory. For Deleuze and Guattari the prototypical looping structure as posited by Nietzsche, of the "eternal return of the same," can be cast in terms of "waste, in active forgetting. ... If eternal return is a wheel, then it must be endowed with a violent centrifugal movement which expels everything which 'can' be denied, everything which cannot pass the test."[lxiv] Deleuze and Guattari further celebrate this wastage, violence and denial.

> A rhizome has no beginning or end; it is always in the middle, ... Where are you going? Where are you coming from? What are you heading for? These are totally useless questions. Making a clean slate, starting or beginning again from ground zero, seeking a beginning or a foundation— all imply a false conception of voyage and movement. ... *Between* things does not designate a localizable relation going from one thing to the other and back again, but a perpendicular direction, a transversal movement that sweeps one *and* the other away, a stream without beginning or end that undermines its banks and picks up speed in the middle.[lxv]

It seems that the human condition, politics, language, art, history, institutions are best understood through the rhizome and the machine running amok, a self-destructive or intensely self-transforming movement without beginning or end.

Network pragmatics

There are several lessons from this analysis of the network's authority. The first is simply that, whether or not we agree with Deleuze and Guattari's account, we might exercise caution in recruiting

the rhizome to represent contemporary aspirations for the emerging globally interconnected communications network. At the very least, we have seen that many of the attributions of the network (democratisation, universality, control, coherence, equilibrium) run counter to their philosophy of radicality, indeterminacy, multiplicities, individualities, and fragmentation. Of course, by a Deleuze and Guattari reading, any communications systems is complex and rhizomic. But this was a feature of language, text, politics and the social order long before the advent of computers and mass communications. To ascribe to digital technologies some determining role in this rhizomic condition is to subscribe to an "arboreal" theory of causation, that in the end privileges a hierarchical, technological, instrumental and metaphysical account of the world.

Secondly, Deleuze and Guattari's arguments cannot easily be recruited to endorse irrationalism and irresponsibility. The tree and the rhizome seem to depend on one another in complex ways, for which we do not yet have an adequate descriptive language, though their writing represents a bold attempt.

The third lesson is to observe that the network notion has the capacity to move discourse towards the transcendent, avoiding the here and now, the existential moment, the phenomenon, in favour of something that does not exist, an ideal, a utopian appeal to the "not yet."[lxvi] The appeal to the network notion masks our everyday experience of screens, keyboards, connecting and disconnecting, the sociality of communities of users, designers, entrepreneurs, breakdown, life outside the matrix of connections, outside the network, that which is disconnected and "other."

A further way to defuse this idealism is to regard networks in the same way we might consider diagrams. Networks can be thought of as projections, visualisations and images rather than windows into some deeper core of reality that otherwise defies representation. To be sure, we now have dynamical, immersive, navigable, and complex visualisations, abetted by fast computer processing. The calculable and navigable properties of these networks are palpable. Deleuze and Guattari have much to say about the diagram, and the map. In flattened terms a diagram has "neither substance nor form, neither content nor expression"[lxvii] Maps and diagrams provoke rather than describe, maps

are an "experimentation in contact with the real."[lxviii] Networks as maps are just such interventions and provocations, or more prosaically, assume status dependent on interpretation and evaluation.

We seem able to relate these diagrams to some state of affairs, such as the layout of Konigsberg, the urban condition, the configuration of the Internet, links within stock markets, transportation systems, stresses in a structure. As with any diagram the process of establishing such relationships between a network and a state of affairs is interpretive, which is to say cultural, social, historical, situational, and hermeneutical.

One of the key characteristics of the network, the loop, can also be ascribed to the process of interpretation. It is commonly supposed that when interpreting a text, piece of music or a diagram we begin from a position of some partial expectation and understanding, which is then modified in light of an examination of the subject matter. The process involves a backwards and forwards movement, a constant process of revision, a cycle of understanding, that converges on a practical understanding for the moment, but which is still subject to revision, a process sometimes characterised as the "hermeneutical circle."[lxix] At one point Deleuze and Guattari briefly allude to this process in terms of shifting territories of impulses and circumstances.[lxx] As a life condition, this cycle of understanding can assume the "violent centrifugal movement" of Nietzsche's eternal return. The circular motion of this understanding can certainly be described benignly in network terms as a feedback loop. But perhaps our attraction to the network notion is also driven by our inevitable participation in the cycle of interpretation, and our technologically-mediated desire to render this experience tangible, concrete and controllable, through the diagram. All of this can be resisted.

We may concede that the process of interpretation is rhizomic. Perhaps the rhizome model has something to contribute to an understanding of networks as a discursive practice. Networks may not be the same as rhizomes, but *talk* of networks is rhizomic, subject to the vagaries of interpretive practice, contexts, historical conditions, contingencies and disruptions. Networks are neither tangible referents, nor immutable schemas of signification, but discursive devices to be adopted or discarded

as needed, and in keeping with their shifting authority, a position that accords with the pragmatics of any representational schema (words) in language.[lxxi]

A further mode of resistance to the transcendence of the network is to think of the network as an effect and not a cause. The effect the network presents is to invest the conditions being so described with a certain value, a privileged status in the realms of the calculable and the striated.[lxxii] It is also the case that the network as effect operates in the manner of a surface, indicating nothing above it, and belying nothing beneath. It is one interpretation among many, provocative in its own right, but a surface against which other surfaces may work and resist.

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i Wigley provides a critical account of the history of the network in modernist discourse, linking the theorising of Marshall McLuhan and Buckminster Fuller. He argues persuasively that the network is an outdated notion whose perennial revival comes about through historically ignorant enthusiasm for new technologies. See Mark Wigley, "Network Fever," *Grey Room* 4 (2001).

ii Starr Roxanne Hiltz and Murray Turoff, *The Network Nation : Human Communication Via Computer*, Rev. ed. (Cambridge, Mass.: MIT Press, 1993).

iii See Marshall McLuhan, *The Gutenberg Galaxy; the Making of Typographic Man* ([Toronto]: University of Toronto Press, 1962).

iv Hiltz and Turoff, *The Network Nation : Human Communication Via Computer* 27. Also see Marvin Lee Minsky, *The Society of Mind* (New York: Simon and Schuster, 1986).

v Manuel Castells, *The Rise of the Network Society* (Malden, Mass.: Blackwell Publishers, 1996) 62.

vi Wolfgang Jonas, "A Scenario for Design," *Design Issues* 17, no. 2 (2001).

vii Richard Buchanan, "Children of the Moving Present: The Ecology of Culture and the Search for Causes in Design," *Design Issues* 17, no. 1 (2001).

viii Alejandro Tapia, "Graphic Design in the Digital Era: The Rhetoric of Hypertext," *Design Issues* 19, no. 1 (2003).

ix Richard G Smith, "World City Actor-Networks," *Progress in Human Geography* 27, no. 1 (2003). and Richard G Smith, "World City Topologies," *Progress in Human Geography* 27, no. 5 (2003).

x Gilles Deleuze and Fâelix Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* (London: Athlone Press, 1988) 21.

xi Deborah Schultz, "The Conquest of Space: On the Prevalence of Maps in Contemporary Art," in *Essays on Sculpture* (Leeds, UK: The Henry Moore Institute, 2001).

xii See Richard Coyne, *Technoromanticism : Digital Narrative, Holism, and the Romance of the Real* (Cambridge, Mass.: MIT Press, 1999).

xiii Brian Massumi, *A User's Guide to Capitalism and Schizophrenia : Deviations from Deleuze and Guattari*, A Swerve ed. (Cambridge, Mass.: MIT Press, 1992).

xiv Georg Wilhelm Friedrich Hegel, *Hegel's Science of Logic*, *Muirhead Library of Philosophy* (London, New York: Allen & Unwin; Humanities P., 1969).

xv For an example of this use of the network see Christopher Alexander, "A City Is Not a Tree," in *Design after Modernism*, ed. John Thackara (London: Thames and Hudson, 1988).

xvi See Horst Rittel, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4 (Weber, Melvin).

xvii Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 5.

xviii Ibid.

xix Plato's dialogues can be regarded as dialectical, and thus participate in a kind of Hegelian indeterminacy. As conversations in language, they could also be seen as rhizomic, and meet Deleuze and Guattari's criteria for radicality.

xx Plotinus, *The Essence of Plotinus: Extracts from the Six Enneads and Porphyry's Life of Plotinus*, ed. G. H. Turnbull, trans. Stephen Mackenna (New York: Oxford University Press, 1948).

xxi Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 12.

xxii Ibid.

xxiii Plato and C. J. Rowe, *Statesman* (Indianapolis, IN: Hackett Pub. Co., 1999) 283a-b. See also Gilles Deleuze and Fâelix Guattari, "The Smooth and the Striated," in *A Thousand Plateaus: Capitalism and Schizophrenia* (London: Athlone Press, 1988).

xxiv Plato and Rowe, *Statesman* 311c.

xxv Aurelius Marcus and Maxwell Staniforth, *Meditations*, *The Penguin Classics* (Baltimore,: Penguin Books, 1964).

xxvi Seneca, *Dialogues and Letters*, trans. C. D. N. Costa (London: Penguin, 1997).

xxvii Pollio Vitruvius and Morris Hicky Morgan, *Vitruvius: The Ten Books on Architecture*, trans. Morris Hicky Morgan (New York,: Dover Publications, 1960).

xxviii Marcus and Staniforth, *Meditations* 73.

xxix Arguably, Stoicism influenced the thinking of the Romantics, through Friedrich von Schiller (1759-1805). See John Sellars, "The Point of View of the Cosmos: Deleuze, Romanticism, Stoicicism," *Pli (The Warwick Journal of Philosophy)* 8 (1999). More surprisingly it has been enlisted to support the modern capitalist outlook, as exemplified by Adam Smith, *The*

Theory of Moral Sentiments, ed. D. D. and Macfie Raphael, A. L. (Indianapolis: Liberty Fund, 1984).

xxx Sellars, "The Point of View of the Cosmos: Deleuze, Romanticism, Stoicicism."

xxxi Marcus and Staniforth, *Meditations* 73.

xxxii See Robin J. Wilson, *Introduction to Graph Theory* (Edinburgh,: Oliver and Boyd, 1972).

xxxiii Simon presents a systems account of the role of "simplification." See Herbert Alexander Simon, *The Sciences of the Artificial*, *Karl Taylor Compton Lectures, 1968* ([Cambridge,: M.I.T. Press, 1969) 106-14.

xxxiv One of the aims of general systems theory is stated thus: "Developing unifying principles running 'vertically' through the universe of the individual sciences, this theory brings us nearer to the goal of the unity of science." Ludwig von Bertalanffy, *General System Theory; Foundations, Development, Applications* (New York,: G. Braziller, 1969) 38.

xxxv Philip Steadman, *Architectural Morphology : An Introduction to the Geometry of Building Plans* (London: Pion, 1983).

xxxvi See Minsky, *The Society of Mind*. Avron Barr, Edward A. Feigenbaum, and Paul R. Cohen, *The Handbook of Artificial Intelligence* (Stanford, Calif.: HeurisTech Press, 1981). and Nigel Cross, "Can a Machine Design?," *Design Issues* 17, no. 4 (2001).

xxxvii Hans P. Moravec, *Mind Children : The Future of Robot and Human Intelligence* (Cambridge, Mass.: Harvard University Press, 1988).

xxxviii Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 15.

xxxix In fact, agriculturalist, Ray Ison, has proposed that colonisation of root systems by symbiotic mycorrhizal fungi might provide a more accurate metaphor.

xl See Simon, *The Sciences of the Artificial* 84-117. on the subject of complexity from a systems point of view.

xli Each node in the network is assigned a number, according to how many arcs are connected to it. The number will be odd or even. If a network has more than two odd vertices, it does not have a Euler path.

xlii Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 21.

xliii The looped nature of the famous London Underground map arguably contributes to its iconic

      status. Compare with Janin Hadlaw, "The London Underground Map: Imagining Modern Time

      and Space," *Design Issues* 19, no. 1 (2003).

xliv Jonas, "A Scenario for Design," 69.

xlv Bertalanffy, *General System Theory; Foundations, Development, Applications* 44.

xlvi Ibid.

xlvii Strogatz identifies the key features of complex networks. See Steven H. Strogatz,

      "Exploring Complex Networks," *Nature* 410 (2001).

xlviii See Simon, *The Sciences of the Artificial* 73-79.

xlix Italo Calvino, *Invisible Cities*, 1st Harvest/HBJ ed. (New York: Harcourt Brace Jovanovich, 1978).

l Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 9.

li Noam Chomsky, *Syntactic Structures*, 2nd ed. (Berlin ; New York: Mouton de Gruyter, 2002).

lii Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 9.

liii Ibid. 22. Their philosophy of "concrete universals" apparently draws on complex theories about

      sets, non-Euclidean geometry and topology. See Manuel De Landa, *Intensive Science and*

      Virtual Philosophy, *Transversals : New Directions in Philosophy* (London: Continuum, 2002).

liv Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 22.

lv Ibid.

lvi Ibid. 254.

lvii Ibid. 15.

lviii Ibid. 219.

lix Gilles Deleuze and Fâelix Guattari, *Anti-Oedipus : Capitalism and Schizophrenia* (New York: Viking

      Press, 1977) 36.

lx Ibid.

lxi Ibid. 42.

lxii Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 22.

lxiii Friedrich Wilhelm Nietzsche, *Thus Spoke Zarathustra; a Book for Everyone and No One*, trans. R. J. Hollingdale (London: Penguin Books, 1961).

lxiv Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (London: Athlone Press, 1994) 55.

lxv Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 25.

lxvi See Richard Coyne, "The Cult of the Not-Yet," in *Designing for a Digital World*, ed. Neil Leach (London: Wiley-Academic, 2002).

lxvii Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 141.

lxviii Ibid. 12.

lxix Hans Georg Gadamer, *Truth and Method* (New York: Seabury Press, 1975).

lxx Deleuze and Guattari, *A Thousand Plateaus : Capitalism and Schizophrenia* 317.

lxxi They outline their pragmatic view of language in Gilles Deleuze and Fâelix Guattari, "Postulates of Linguistics," in *A Thousand Plateaus: Capitalism and Schizophrenia* (London: Athlone Press, 1988).

lxxii Deleuze and Guattari equate the striated with the hierarchical and gridded world of calculation. See Deleuze and Guattari, "The Smooth and the Striated."