

Networking by metaphors

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Abstract:

Katherine Hayles (2002) noted that the symbol-processing machines we call computers are more and more hooked into networks which connects to apparatus that can *actually do things in the world*. Digital networks can thus be seen as a specific assemblage of material and semiotic processes. In this situation tools become signs, and signs become tools. How does this networked tool-sign oscillation come about? In this paper it is argued that this is mediated by metaphors, on several levels. Lakoff and Johnson's theory of conceptual metaphor (1980) is a good starting point, but has its limits. It will be shown that this theory provides no account of metaphorical transmediation processes outside the human mind. I propose an extension of this theory with Hayles' concept of 'material metaphor', and recent critiques in terms of 'discourse metaphors'. My claim is that these notions enable an ontological and epistemological clarification of daily Internet practices.

To introduce what is at stake in the field of contemporary computerized communication I will start with a short story. From this micro case study I develop my argument about the constitutive role of metaphors in daily digital networking practices. Subsequently three kinds of metaphors are addressed: conceptual metaphors (Lakoff & Johnson 1980, Lakoff 1987, 1993), material metaphors (Hayles 2002), and discourse metaphors. Finally I evaluate whether these terms enable an ontological and epistemological clarification of the currently omnipresent notion of network.

Years ago a friend of mine had problems with her brand new cable connection. She asked me to have a look at her computer.

It was already on, and she clicked on the mail icon.

'See, no mail. And I'm sure I have mail, I forwarded some from my office. That man who did the installation yesterday said everything was working fine, just click and go. But well, no mail.'

'Okay', I said, 'Are you sure you are online?'

She pointed vaguely at the wires, still hanging all over the place, coming in from the hallway, swirling to her desk. 'I suppose so...'

But I did not mean the wires. I looked for the connection icon. Fortunately, it was there, on her desktop. Moreover, it appeared to be correctly configured for her account. After a click it established the connection. And after clicking 'get mail' her mail came in promptly.

'You first have to connect with that icon', I said.

My friend was puzzled. 'Why, that telephone icon? I used that to dial up, but now I have a permanent connection. Just like I have at work. There I always see my mail immediately in the inbox, without having to click on anything.'

'Well', I said, 'Apparently your computer at work is configured that way. That telephone icon stands for any kind of connection. But you can bypass it. It is possible to connect automatically when you start your computer or your mail program. And also to fetch your mail as soon as you start your mail program. We can arrange that, if you want.'

And so we did.

1 Fooled by iconic literacy

That was all. In fact amazing, since such problems usually cost hours of trial and error and reconfiguration (or worse, re-installation or reformatting). But here we got a clear,

comprehensible problem. Just one small conceptual error, just one small hidden step in between.¹

Though this happened years ago, the story is still up to date. It is illustrative of how computerized mediation works, how it often fails to work, and how this mostly has to do with conceptual misunderstandings, material misconfigurations, and hidden steps in a network of causal connections.

The anecdote might too easily be read as a classic example of computer illiteracy, but that would miss the point. On the contrary, this is a story about literacy. My friend was no Internet newbie or computer illiterate. She was acquainted with e-mail at work and at home, she knew the difference between dialling up with a telephone modem and a direct connection, she was able to forward mail. In fact, she was rather too literate, regarding icon reading.

In fact she just took the icons literally. The mailbox icon was supposed to open her inbox, where her mail was supposed to be. Literally: mailbox = mail. The desktop icon, the reference = the referent. The medium = the message. But in this case there were no messages. At least not until some steps in between were undertaken.

In the following part I want to take a closer look at these implied steps in between, the steps in between 'just click and go'. These will be analysed in terms of what can be called material-semiotic movements, since both machinic/material processing and human information processing are involved (Hayles 2002). My friend's problem emerges as the result of three material-semiotic movements coming together, which I will subsequently address: iconic metaphoric seduction, the desire for immediacy, and transmediations at several levels.

1.1 Iconic metaphoric seduction

The first movement has to do with the disposition to take the icon literally, take it for the referent: take the mailbox icon for the mail itself, take the telephone icon for using the phone itself. We could call this phenomenon 'icontology', indicating the replacement of the icon with a particular ontological *state*, a contingent mode of being. This movement is the result of iconic metaphoric seduction by the interface.

The inclination to take the icon for a specific *state* instead of a referential button able to invoke a performative *process*² is very strong. In fact, this is part and parcel of the very function of desktop icons. These icons are shorthand for complex machine processes. A desktop icon – mostly a visual representation of a metaphor, based on an associated resemblance or metonymic contiguity with the process involved – functions as an interface between complexity and simplicity, between executing machine processes and meaningful user action. That's the heart of our contemporary iconic computer interfaces: translating complex processes into user-readable stable states, and translating user action into complex machine readable processes. The icon can only carry out its signifying *and* executing job by concealing the involved complexities and highlighting stable states.

In this case the mailbox icon conceals the complex processes it refers to: executing a particular mail program, including configurations of a particular Internet connection via a particular Internet access provider, a particular mail account at a particular Internet service provider, with particular incoming and outgoing mail servers. At the same time, the icon highlights a specific result of the process (received mail) or a contiguous 'location' involved (the so called inbox). The same holds for the telephone icon. This icon conceals the fact that it is referring to executing an Internet connection program, including particular configurations

1 In fact two of the same kind: the hidden step of connecting, and of invoking the 'get mail' command.

2 The distinction between process and state is elementary for programmers and software designers, but not for semioticians or social scientists. I owe this valuable analytical insight to software designer and software theorist Bernhard Rieder, Paris-Utrecht Mini-Symposium November 2003.

of the hardware devices and the Internet account involved; it highlights the contiguous telephone device.³

So both icons refer indexically, even causally, to machine processes to be executed, and not to a specific state, place, or thing. Yet, at the same time they conceal this, and represent specific ontological states as signifieds in order to provide a clear human readable sign. We might say: The icons conceal their material performative reference by 'ontologizing' the process involved into a stable representation.⁴ In other words, the metaphorical icons on our desktops do their work by *representing* an ontologized simplicity, while *depresenting* the performative complexity. That's the way the icon manages dynamic complexity, that's exactly the task we have delegated to these icons. And that's why we are seduced, indeed compelled, to take icons literally, at 'interface value'.

1.2 The desire for immediacy

Secondly, there is the phenomenon of expected immediacy. My friend expected the mail to be in her inbox, immediately, just by looking there. In a certain sense, she was far ahead of her time: she was enacting the ideal of ubiquitous, invisible computing, which makes things happen just by looking or – even more utopian – just by thinking. These interfaceless computers have not yet arrived in our homes (and probably never will), but our contemporary interfaced computers do the utmost to come near this ideal.

The suggestion of immediacy is already evoked by the shortcut icons themselves ('click-and-go'), but is also strongly sustained by the general 'one-click' discourse which accompanies contemporary Internet practices: immediate access, always on, instant messaging, one-click shopping, plug & play, automatic updates et cetera. These notions refer not so much to speed and the bridging of time and space, they refer to the ideal of the total transcendence of any speed, time and space. They refer to total immediacy, which implies a telos to the total erasure of reference itself. Reference and referent become one and the same, here and now, immediately. No mediation or transference in between; no material, temporal and spatial obstructions to conquer. These notions represent a desire and a belief in the possibility of direct, completely unmediated communication. This is the idea of ideal communication, the idea of immediate understanding without obstacles or effort.

The discourse of the ideal of immediacy seems to be connected to the advent of 'new media', i.e. digital mediation, but in fact it is not that new. It has been analysed as the motor behind the historically progressive sequence of all past and present new media, be it the telegraph, radio, the Internet or mobile phones (Peters 1999, Bolter & Grusin 2000, De Vries 2005). Each time a new medium promised to make up for the mediation fallacies of a previous medium.

³ The telephone icon in fact enacts a double replacement. We learned already not to take the telephone icon literally, since we 'know' it refers to the telephone modem and not the telephone device itself.

⁴ Some scholars would call this 'substantializing' (e.g. Rammert 1999), yet I see substantializing (to treat as a solid substance) and reification (to treat as a thing) as particular instances of ontologizing. It should be noted that ontologizing would not necessarily imply a reduction; ontologizing is a productive epistemological act of classifying and thereby creating an object of knowledge and intervention. In this act a complex process is abbreviated, concretized, and translated into a specific *state, thing, or place*. When this translation replaces entirely the initial complex process, the act of ontologizing is completed. These ontologized instances need not necessarily be represented as isolated; they may imply or evoke their own coherence and ontology. When taken up in a broader discursive formation this may result in the historical creation of organizing concepts along axes of knowledge, power and ethics (Hacking 2002). Ontologizing (replacing dynamic processes with specific states, things, or places) is in a way the inverse twin of essentialising (replacing concrete states, things, or places with presumed essential properties).

Even deeply pessimistic arguments which assert cultural decline caused by the proliferation of media, are rooted in the ideal of immediacy. These analyses criticize new media as distorting the supposed immediacy of 'real', face-to-face communication (e.g. Postman 1993). So, whether one claims progress or decline by new media, the shared bottom line is the desire for immediacy. Immediacy is all around conceived as the best you can get, the standard and touchstone by which any mediation and communication can be measured.

In other words: the desire for immediacy is the default disposition, yet it only shows itself in a failure, in a break-down which reveals retrospectively the default expectation of immediacy. The fact that my friend expected the mail to be there immediately could only become clear because the mail just was *not* there. Had her mail indeed been there, she would probably not have noticed anything particular. The thousands of moments a day we might experience as immediacy never occur as such to our mind. Experiences of immediacy go by unnoticed, unperceived, unconscious, since there is no need for any reflection or second thoughts. Hence, the idea of immediacy only shows itself when there is a sudden lapse in a taken for granted mediation. Immediacy can be seen as the 'degree zero' (Barthes 1953) of any mediation, a quest for a neutral, transparent mediation deprived of all traditional markers that heralds an encounter with media and interfaces as such, but which will only show itself as lack, as a gap between medium and message, between medium and mind, and between medium and reality.

All media, in their own particular ways, have to deal with this gap, the ontological gap between on the one hand the material conditions and enactments of media apparatuses, and on the other hand their 'messages' – their representations, simulations or even productions of reality. Our current desktop computers do this in their own way. They widen the gap by adding more and more complex processes in between the medium and the message – materialized in more hardware devices, connection slots, applications, helper applications, software plug ins, patches, et cetera. At the same time they diminish the gap by concealing these material processes: translating them into visible metaphorical icons and shortcuts, and into invisible embedded applications, automatic updates, and system preconfigurations. Computers can be configured to automate all kinds of processes – connect to the Internet as soon as the mail program starts, get new mail as soon as the mail program runs - and when all this works properly, this may invoke a sense of seamless mediation, on the edge of immediacy. But to approach this state a lot of invisible processing labor has to be deployed. Labor by hardware machinery to transform energy into voltage differences; labor by software to assign digital numbers to patterns of voltage differences, and subsequently translate some of these patterns into human readable signs; labor by humans or software to accomplish installation and configuration; and on top of that human cognitive labor to interpret the signs, and human performative labor in the acts of selecting, clicking, and typing. My friend was very aware of the hardware installation labor which comes with a permanent Internet connection. She wisely delegated this to a professional. But she was not prepared for the configuration labor required by the software. Again, this is no instance of computer illiteracy, this is computer literacy, induced by frequent experience with computers. We tend to forget the labor of software.

In fact, properly running software urges us to forget this - this is the very reason we have delegated most of the processing labor to imperceivable software processes. The deal is: the software represents on the interface *that* it works, while deprecating *how* it works. At least, a good interface provides such reassurance. Thus we get used to handle software as a black box, in which only the input and the output matters - the paradigm of so called user-friendliness. Software only shows something of how it is supposed to work when it fails; then we need to open the black box, and consider all the hidden steps and hidden labor in between.⁵

⁵ In this sense, computer failures are analytically and epistemologically more illuminating than smoothly working computers.

1.3 Transference and transmediation

Thirdly, there is the movement of transference between different domains. In the case of my friend the transference was between home and work. Not only literally (in the act of forwarding mail from work to home) but also conceptually. My friend was used to the configuration of her computer at work, where she never had to connect to the Internet before receiving mail. She transferred this experience to her newly configured home system, based on her tacit knowledge of a few similar states: both computers had a Windows operating system, both had a permanent Internet connection, both had a mail program installed. She implicitly assumed enough parity between her office and home computer to yield the same results. Yet, it was not enough, since complete transference of the results also implied complete transference of the hidden configurations.

These kinds of transferences are omnipresent in our contemporary thoroughly networked environment. The transferences may fail, succeed, or partially succeed, but however they are fundamental for the machinery of society. The technology of electricity and the electrification of society enlarged enormously the network of possible transference situations - not only of energy transfer, but also of cognitive transfer. The cognitive principle of transference enables us to learn very easy to operate different devices and machines. Once you are acquainted with the operational concepts of wires, switch plugs and buttons on one device, you can transfer this knowledge to other devices. This general cognitive principle is based on mimesis: the transference of experiences, acts and concepts from a familiar domain to a relatively new domain.

Computing in general relies heavily on the principle of cognitive and machinic transference. The ongoing streamlining of operating systems and interfaces – for instance the default menu tool bar with the standard items 'file', 'save', 'edit', 'copy' et cetera, but also default keyboard combinations which work alike in different applications – assumes and reinforces this transference principle.

Since computing is not only based on the technology of electricity but also on digitality, the network of possible transferences becomes even larger. Digital transferences not only occur on the level of operating the computer, but also between different media devices, on the level of message transfer: the digital-material transport and translation of data and files. The message transference can be done between different computers (copying files via a disk, sending mail, FTP-downloading, P2P-sharing), between different applications (converting a wav-file into a MP3-file, creating a PDF-file from a Word-document) and between different media forms and modalities (scanning of a print picture, online streaming of television broadcasts).

Most of our daily computing activities consists of these acts, which can be called *transmediations*, i.e. transferences between different media modalities and between differently formatted messages. Sometimes these transmediations are manually enacted, most of the time they are mediated and enacted by hidden software processes. Most of the time these transferences go on smoothly, but sometimes ruptures occur. Considering the numerous mutual interactions and interferences between different computers, different configurations, different applications, different formats, and different network protocols, it is actually amazing how often computerized transferences succeed without failure.

In my friend's case it was indeed quite a miracle that only one little step in between was missing to make the transference from work to home complete. Think of the thousands of aspects that could possibly have been different: The man could have done a bad job with the wires or the configuration of the cable modem; her connection wizard at home could have been not yet configured; a network protocol or client could have been missing; her mail program at home could have been not properly configured for the mail server; she could have caught a vicious virus; a firewall could have been installed, et cetera.

It could have been so much worse - and we all know this by experience. Anyone who ever tried to copy the settings and configurations of an old computer to a new one, or tried to transfer the settings which work on your own computer to the computer of a friend, knows that a complete one-to-one transfer from one 'digital domain' to another is practically impossible. Simply because two domains are never exactly the same. Small differences between the initial states of the two domains may yield great differences in the process after transference. Transference from one domain to another can thus only be partial. Eventually the transference will be more a transformation or translation than an identical unmodified copy, which goes completely against the grain of the dominant discourse of identical digital copies.

We know this, and yet, we keep forgetting this. Until some kind of rupture reminds us, and urges us to look for the differences between presumed identical domains. These sudden ruptures in expected immediacy and taken for granted transference wake us up from our iconological slumber and urge us to peek into the black box of processing labor and network translations. However, as soon as we have identified the hidden steps and fixed the problem, we can fall back into blissful forgetfulness. From then on we can afford to take things just 'at interface value' and not worry any more about the network labor involved. And everything will work accordingly - blackboxed.

These processes of manual and machinated transferences combined with cognitive transferences of learning and then forgetting makes up computer literacy and network literacy, in short digital literacy. This literacy is constituted ontologically by intricate interactions between human information processing/signifying and machine information processing. And it is constituted epistemologically by oscillating between the literal and the figurative, and between learning and forgetting.⁶

My claim is that, to bring these elements together, to think them into one another, a 'material semiotics' is needed, i.e. a semiotics of material practices of transference and cooperation (or conflict, or coexistence) between human information processing and tool/machine information processing. In the next part I will try to outline the contours of such a material semiotics, starting with an analysis of the role of metaphors in digital network literacy.

2 Networking by metaphors

In my friend's network problem we already saw metaphors in action on several levels. Firstly, desktop icons as such are shorthand signs or metaphors which stand for complex software procedures. The way icons represent particular applications is mostly based on a metaphoric resemblance or contiguity⁷ with the process involved. The mailbox icon is based on a resemblance with postal mail; the connection icon is based on the association with the contiguous device of the telephone.

Second, we encountered the phenomenon of metaphoric seduction, or 'iconology', the disposition to take the metaphorical icon literally, to substitute the referrer by the referent – to take the mailbox icon for the mail itself, to take the telephone icon for using the phone itself. This disposition is sustained by the two fold metaphorical labor of the icons: they *represent* at the screen interface an ontologized, metaphorised simplicity, while *deprenting* the dynamic complexity behind the screen. Furthermore, the disposition is sustained by the desire for immediacy ('click and go'). This desire makes us all to willingly take for granted that referrer

⁶ And perhaps not only computer literacy, perhaps the same holds for typographical literacy.

⁷ This is a departure from the classic distinction between metaphor (as based on resemblance, similarity) and metonymy (as based on proximity, contiguity). Here I follow Lakoff and Johnson's (1980) loose but adequate definition of metaphor as any concept which stands for another concept. This definition is more extensive than the common literary definition; it includes analogy, simile, metonymy and polysemy. See also Goossens (1995) who proposes the hybrid tropical concept of 'metaphonymy'.

and referent are collapsed in one metaphorised sign: to click is to go, is to get the expected result.

And thirdly, we saw that transferences between different domains were involved. Conceptual transferences (computer configurations from work to home) and material-mediated transferences (sending mail, computing in general). The transference of experiences, acts and concepts from a familiar domain to a relatively new domain is the basic paradigm of learning situations and experience, but it can also be analysed as paradigmatic of metaphor as such. The Greek etymological origins of the word 'metaphor' are taken from *meta*, indicating 'after, over, across' (but also 'changed', which should always be kept in mind), and *pherein* meaning 'to bear, to carry'. In modern Greek the word metaphor also means literally transport or transfer. Not coincidentally, buses in Athens are called *metaphorai*, as they are vehicles which transfer you from one place to another. So, be they buses, words or visual icons, metaphors are means of transference. Not necessarily transference of 'meaning'; it can also indicate the transference of a thing, of an act, of a message, of your self, or of a story, as Michel de Certeau puts it:

'In modern Athens, the vehicles of mass transportation are called *metaphorai*. To go to work or come home, one takes a 'metaphor' - a bus or a train. Stories could also take this noble name: every day, they traverse and organize places; they select and link them together; they make sentences and itineraries out of them. They are spatial trajectories.' (De Certeau 1984, p.115)

Hence, metaphors can be seen as transference in the broadest sense, a mixture of transport and narrative translation, of spatial and conceptual transference.

2.1 Conceptual metaphor

Lakoff and Johnson's (1980) famous theory of metaphor⁸ is entirely based on this transference paradigm. Metaphor is the transference of concept *x* taken from domain *X* and transported into domain *Y*, with the result that concept *x* is understood in terms of *y*: 'The essence of metaphor is understanding and experiencing one kind of thing in terms of another' (p.5). Metaphors are defined as cross-domain mappings, sets of conceptual correspondences of features and elements across conceptual domains, which can be stated in the formula: *Y IS X*, or *TARGET-DOMAIN IS SOURCE-DOMAIN* (Lakoff 1993, p.207).⁹

Classic examples of such conceptual metaphors are *TIME IS MONEY* (articulated in common expressions such as 'wasting time', 'saving time') and *ARGUMENT IS WAR* ('defending a position', 'winning an argument'). It is important to notice that the mapping from source-domain to target-domain is never completely one-to-one. Some parts of the respective domains remain unused in the metaphorical transference, some parts are highlighted, others are downplayed. Metaphorical correspondence between source-domain and target-domain is always only partial.

In any case, transference of a concept from a source-domain to a target-domain is the basic mechanism of metaphor. Note that metaphor here is not only metaphor as poetic figure; Lakoff and Johnson show extensively how metaphorical concepts are pervasive in daily life, and how they thoroughly frame our actions, thoughts and linguistic expressions, in a coherent though not always consistent system. They claim that conceptual metaphors are the building blocks of the whole human cognitive system, grounded in sensory-motor experience and elaborated in cultural contexts.

⁸ Dubbed by Lakoff (1993) the Contemporary Theory of Metaphor (Lakoff 1993) but also known as the Cognitive Theory of Metaphor, or the Conceptual Theory of Metaphor.

⁹ The notation of conceptual metaphors in capitals is taken from Lakoff and Johnson (1980).

We could map the source-domain and target-domain of the mailbox icon in this way. The underlying regulating conceptual metaphor would be E-MAIL IS POSTAL MAIL, and the cross-domain mapping would look like this:

SOURCE-DOMAIN	TARGET-DOMAIN
postal mail	e-mail
postbox	mail program
letters	messages
sending and receiving mail	push the send or get button
disposal of read mail	delete button
sorting mail	distribution to different folders
[postal distribution system]	[mail-server at provider]
[delivery by postman]	[connecting to mail-server; fetch command]

However, here we encounter some problems. The last two correspondences are indeed at work in the transference but these are also exactly what is hidden in the iconic one-click metaphor. They *are* and *are not* part of the conceptual mapping. In fact, they are present in their absence. They are what I have called *deprented*, while the other correspondences are represented.

2.1.1 The black box of the machine

Note that this deprentation does not coincide with Lakoff and Johnson's notion of downplayed or hidden parts of the domains. Hidden or unused parts in the metaphor E-MAIL IS POSTAL MAIL might consist of 'stamps' in the source domain, or 'viruses' in the target-domain. These aspects remain unused in the conceptual metaphor, they have no correspondence in the other domain, and they are not necessary to establish the metaphorical concept. However, the aspects 'postal distribution system' and 'delivery by postman' in the source-domain do have a correspondence in the target-domain – indeed, they are indispensable aspects of the metaphor, they lie at the heart of the success of the transference. The only thing in which these two aspects differ from the others is that they are not directly represented as operations for the user; their operation is delegated to hidden software processes. While these aspects are foundational for the metaphorical transference at stake, they have no proper place in the conceptual source and target-domains. We might say that what the theory of Lakoff and Johnson contributes to the understanding of the working of desktop icons, remains at the interface level. It does not go beyond the representations on the screen and the corresponding concepts in the mind of the user.

In other words, the conceptual mapping model ignores the material operations involved in the metaphorical transference, both on the side of the user (clicking, configuring, or otherwise invoking software processes) and on the side of the machine (code running, connections being made, fetching mail).

In scheme we have a situation like this:

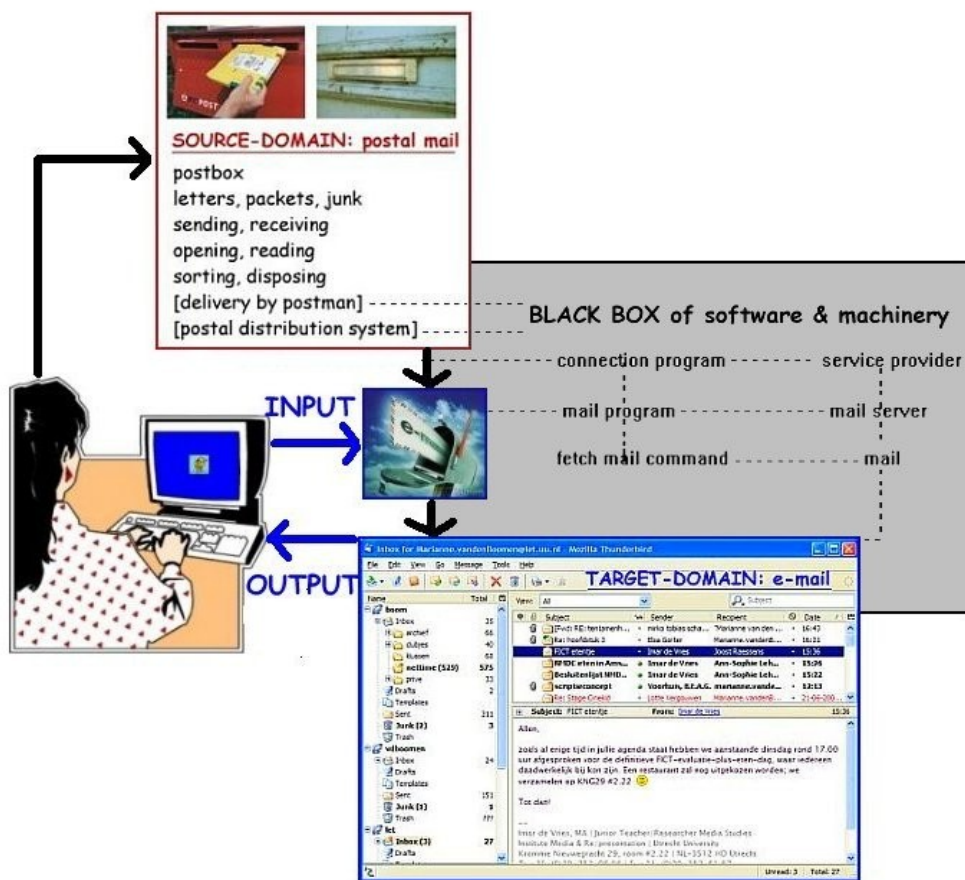


Figure 1: Input-output mechanism of conceptual metaphor with a black box

This is a situation of input and output, with a closed black box. The input and output mechanism consists of the metaphorical icon and the cross-domain mapping between source and target, but as long as the mapping does not involve the black box of software and machinery, the model in itself remains 'iconological'. It equates/substitutes the reading and understanding of the icon (mediated by the source-domain) with the expected result (the target-domain).

Yet, reading and understanding the icon is not enough to let it do its job. While this suffices for linguistic or visual metaphors, it will not do for the desktop icon. The desktop icon needs *action* to complete its referential task. Not only action from the user, who must click on the icon, but especially action inside the machine and the network.

In that sense, the icon is a two-faced Janus: one side is headed towards the user, who must be able to read, understand and operate the icon, and the other side is headed towards software and machine processes. But the user is only able to read the icon as far as the other side is concealed and deposed, i.e. blackboxed.

In order to open up that black box we, as new media scholars, need besides the notion of conceptual metaphor a more material notion of metaphor. A material notion which can give an account of not only the signification process but also of the acts and physical transformations involved. This will be elaborated in the next chapter.

2.2 Material metaphor

It may be that the notion of materiality sounds odd in the context of software and code. Is software material? Or is it non-material, virtual? The latter, in fact, is the dominant vision. Katherine Hayles showed in her classic work *How we became posthuman* (1999) how 'information has lost its body' during the history of informatics and cybernetics. She particularly revealed how much deliberate epistemological and ideological labor was involved to achieve this result. Indeed, software is nowadays usually conceived as disembodied, immaterial information, as a virtual pattern. In that sense, the virtual and the material are seen as oppositional dichotomy, echoing the age old Cartesian split between mind and matter. Less Cartesian is a conception of software as ontologically situated somewhere between the virtual and the material. Though this may lead to a flexible hybrid ontology for software, it leaves intact the dichotomy of virtuality and materiality as such, and this is not very fruitful. The dichotomy takes no account of the fact that virtuality is always materially configured (by machinic mediatic processes and states) and the fact that materiality is always mediated (by perception and by representation). The relation between virtuality and materiality is further complicated by what I have dubbed processes of derepresentation: the semiotic productive concealment of material processes of mediation and transference. What is at work in software can better be analysed in terms of 'material semiosis', as a practice of transference and cooperation between human information processing and machine information processing.

This is the direction Hayles takes in her book *Writing machines* (2002). The book addresses (and expresses, in its typographical design) the materiality of analog and digital texts, and explores how literature can transform from inscriptions rendered as durable marks of print into 'technotexts', dynamic images on computer screens.

These dynamic images should not be conceived as classic visual representations, now displayed by pixelated pictures or movies. Hayles focuses on the material qualities of 'literal' text: words, indents, spacing, page layout, typeface, and their new digital possibilities of automation, interaction and iteration. She analyses how the connections and intermediations between the symbolical (narratives, ideas, genres, metaphors, signs) and the material (carriers, re/production technologies, forms, disseminations, interfaces, modalities) come about.

In this context Hayles introduces the concept of *material metaphor*, the instance of metaphor where the transfer of meaning or action does not take place between words or concepts, but between *signs* and *physical artifacts*, between symbols and material apparatuses. The material metaphor thus creates a dynamic connection between a symbol or sign (more properly, a network of symbols/signs) and a material artifact (Hayles 2002, p.22). Hayles stresses that the occurrence of material metaphor is not confined to digital products, neither to literal or literary texts:

'This kind of traffic, as old as the human species, is becoming increasingly important as the symbol-processing machines we call computers are hooked into networks in which they are seamlessly integrated with apparatus that *can actually do things in the world*, from the sensors and actuators of mobile robots to the semiotic-material machinery that changes the numbers in bank accounts.' (ibid, 22, emphasis by MvdB)

Hence, a material metaphor does not just produce meaning, it is also able to evoke acts in the material world. A material metaphor can take on any modality – textual, visual, acoustic, performative – and can nestle itself in any medium or device as both a semiotic and operational connection between a sign and a physical event. Its instantiation often takes the form of some kind of switch or button, as in the case of desktop icons, which are visual metaphors and operational buttons in once. We might also think of other symbolical-operational signs, such as textual hyperlinks on a web page (referring and transferring files in once), an acoustic fire alarm which automatically connects to the fire department (indicating fire, and evoking its combat), moving objects or persons activating surveillance cameras (indicating the act of burglary, and evoking its recording and chasing down).

In fact any button or switch can become a material metaphor when its meaning includes yet goes beyond its instrumental operability. Material metaphors creates two kinds of surpluses, depending from the point of view: a surplus of meaning, on top of the instrumental function, and a surplus of material-physical action, on top of the semiotic meaning. In their two-way direction material metaphors function as switches between symbolical-semiotic networks (sign systems, conceptual clusters, languages, scripts) and physical networks (digital networks such as the Internet, banking computers, telecommunication networks, surveillance circuits, and home computer networks, but also non-digital networks such as social networks, economic networks, transportation infrastructures, and so on).

The ongoing proliferation of transmediations, induced by the interconnectivity and iterability of electricity and digitality, results in more and more material-semiotic, techno-social hybrids, such as databased friendship networks, online communities, virtual companies, and other dispersed but networked organisations. This can all be seen as evoked by the productive labor of material metaphors.

In this situation, when material tools become more and more sign systems, and sign systems become more and more tools, we are not just transferring messages anymore, neither are we just doing things. We are doing things in the world and to the world by transferring messages, thereby extending the tool-sign machinery. By doing so we transform the world, our environment, and thus eventually ourselves as subjects.

2.2.1 Transmediations and apertures in the digital black box

It must be clear that, compared to the notion of conceptual metaphor which mediates between conceptual source and target-domains, the material metaphor focuses on other kinds of transference and transmediation. While it presupposes and parasitizes on the transference between conceptual source and target, it primarily mediates between material force and event. While the conceptual metaphor can explain what happens inside the head of the user as connected to what happens on interfaces, the material metaphor leads us from the hands of the user (the force, the action of clicking) through and behind the interface, inside the physical machinery (events in the PC and other devices which make up the physical Internet). And eventually, it returns its results to the human user.

It is tempting to see the events-domain of the Internet as a complete digital domain, consisting of digital code, floating ones and zeros – as Saussure's chain of differential signifiers come to live; or rather, as a network of signifiers come to live. However, the events-domain of the Internet not only consists of digital stuff, i.e. software (client programs, server programs, computer languages, network protocols, commands, data packets, files) but also of hardware (PC's of the user, servers of Internet providers, cables, modems, routers, switches).

This hardware is not just an neutral enabling device for executing the software; it is also an enabling device for human sense making. Unlike hardware devices we as humans have no direct access to the digital, for we are not able to make sense of bits, patterns of zeros and ones.¹⁰ For us humans zeros and ones are naked signifiers without signifieds, as their relation is not constructed by analog semiotic or linguistic conventions but by digital numerical computations. However, we do have partial access to digital events. This is possible because transmediations and translations by material hardware can occasionally be represented to us as readable signs with conventional signifieds. We are able to read and act upon parts of the software as it is represented by configuration menu's ('mail server settings') or other interface buttons ('get mail', 'send mail'). And if we are suitably trained in computer languages¹¹ we are

¹⁰ Though patterns of zeros and ones are yet impossible to read for humans, the very notion of zeros and ones is already a translation to meet human conceptual capacities. In fact, machines don't 'read' zeros and ones, they just distinguish a small voltage from no voltage, and operate upon these differences in current.

¹¹ And of course, if we are allowed or licensed to do so. For ordinary users this is only the case in open source software.

even able to read and modify the program itself, not just its operation or configuration but its source code. Moreover, we can have basic notions of digital 'entities' without needing any coding skills: we can hold in mind conceptual entities like 'connection program', 'mail program', 'service provider', 'mail server' and so on.

These kinds of representations and translations are conducted by material metaphors on several levels: hardware design (slots, buttons, ports, drives), interface design (icons, menus, pointers, arrows, symbols, file names), software modalities (assemblers, compilers, source code, scripts, executable applications, files, tables in databases), and protocols (sets of rules for translation and transfer). While these instantiations of material-semiotic boundary switches mostly go by unnoticed, they are however at hand, as keys to open up the black box. We are potentially able to follow their subsequent translations and transferences, by a kind of epistemological reverse engineering: this connects to that, this translates that into something else, then it is transported to that, and so on.

In other words, material metaphors not only transfer meanings and actions, and not only perform the necessary labor of translations between energy, hardware, code, acts and events; they also provide apertures by which we are able to peek inside the digital black box. At least they enable us to have a partial view on what is going on inside. As new media scholars we can benefit from these epistemological hacking tools, and use them to extend our knowledge of digital networking practices.

Yet, for ordinary users the metaphoric apertures need not be too obtrusive. As an ordinary user you just want to operate your computer with a peace of mind. This necessarily implies black boxing, since this enables you to forget processual complexity. As we have seen, the iconological labor of conceptual metaphors produces such black boxes, but it should be noted that the production of taken-for-grantedness takes more than just metaphorical iconology. It also needs support of a broader discursive formation.

3 Discourse metaphors

Conceptual metaphors and material metaphors do not operate in a social or cultural vacuum. No matter how determined they are by human sensory-motor experiencing or embodied in material-semiotic machinery, metaphors – as rhetoric devices, as ordinary expressions, as unconscious concepts, and as material switches - operate in discursive formations regulating networks of power, truth and knowledge (Foucault 1980). Metaphors are embedded in discursive formations, and are thereby constitutive of certain views of the world, of society, of how things work..

As such metaphors are never neutral ways of expression or operation, but neither are they unambiguously supporting dominant discourses. Metaphors might be taken up, mobilized, negotiated, elaborated, rejected, reformulated, redesigned, and criticized in order to achieve specific goals. This has been analysed in terms of the 'politics of metaphor' (Hellsten 2002) and in terms of narrative or discourse metaphors (Zinken et al. 2005).

The notion of discourse metaphor has been introduced as an extension of Lakoff and Johnson's theory of conceptual metaphor, which has been criticized as too confined to the individual mind, too quasi-universal, and too static. Their model does not provide a vocabulary which can give an account of cultural differences in concept interpretation and mapping, neither of social transformations in metaphorical concepts over time (Hellsten 2002). By distinguishing *discourse metaphors* - which frame social assemblages of thought, articulation and action - from conceptual metaphors - which frame cognitive assemblages of thought, articulation and action - the discursive politics of metaphors can be brought into the picture.

As we have seen in the case study of my friend's computer problem there is a strong discourse of transparent immediacy which supports and reinforces the iconology of conceptual desktop

metaphors. The question then is: Is this discourse sustained by specific organizing metaphors? In other words, are there discourse metaphors at work? The answer is yes, as will be shown in the next chapter.

3.1 The conduit metaphor

In fact, Lakoff and Johnson (1980) already addressed what might be analyzed as a discourse metaphor on communication, though they conceived it as a complex conceptual metaphor. In the chapter 'Metaphorical systematicity: Highlighting and hiding' they refer to Michael Reddy (1994 [1979]):

'A far more more subtle case of how a metaphorical concept can hide an aspect of our experience can be seen in what Michael Reddy calls the "conduit metaphor". Reddy observes that our language about language is structured roughly by the following complex metaphor:

IDEAS (or MEANINGS) ARE OBJECTS.
LINGUISTIC EXPRESSIONS ARE CONTAINERS.
COMMUNICATION IS SENDING.

The speaker puts ideas (objects) into words (containers) and sends them (along a conduit) to a hearer who takes the idea/object out of the word/containers. Reddy documents this with more than a hundred types of expressions in English, which he estimates accounts for at least 70 percent of the expressions we use for talking about language.' (Lakoff & Johnson 1980, p.10)

Reddy analysed ordinary English language expressions about the transfer of thought, such as: 'I gave you that idea', 'Your reasons came through to us', 'Insert that thought elsewhere in your paragraph'. In this metaphorical frame message transfer is conceived as the transportation of wrapped stable cargo. Though the examples all refer to spoken or written language, it can easily be seen that this frame also holds for other articulations. Movies, television programs, websites and desktop icons are supposed to contain ideas or meanings, which can be sent along to publics, who just have to unpack the contingent media wrapping 'to get the idea'.

Reddy showed that the wrapping is supposed to contain ideas just as human minds are supposed to. Put in Lakoff and Johnson's terms, this is yet another conceptual metaphor co-constituting the conduit metaphor: COMMUNICATION MEDIA ARE HUMAN MINDS. The conduit frame implies and reinforces the idea that thoughts as such are pre-existing within human heads, are able to flow disembodied or reified (in words or other representations) through ambient conduits and eventually arrive undamaged and unchanged inside other human heads.

The paradigm of *disembodied ideas* can lead to radical conclusions: 'In the simplest of terms, the conduit metaphor lets human ideas slip out of human brains, so that, once you have recording technologies, you do not need humans any more.'¹² (Reddy 1994 [1979], p.188) The paradigm of *reified ideas* seems to suggest an opposite focus on material instantiation but since this can be any instantiation by any medium without any consequence whatsoever for the idea of 'stable idea', this boils down to the same assumption: 'thoughts and feelings exist independent of any need for living human beings' (ibid, 170). Ideas in this model are conceived as ontologized things inside your head or out there to grab, to wrap, to transport through a conduit, and to unpack - for everyone human being under the same conditions.

¹² Here we recognize the Transhumanist Extropian dream of downloading the human mind. See Moravec (1988), and see Hayles (1999) for a critique.

Lakoff and Johnson note that this metaphor highlights that utterances have meaning in themselves, and hide any dependency on the context, the sender, or the receiver. Reddy goes further, and states that this frame imposes a structural bias in communication discourse, 'even though nothing more than common is necessary to devise a different, more accurate framework' (ibid, 165). This produces frame conflicts in daily communication practices. Indeed, we can easily see that, while our discourse on communication is framed by the smooth conduit metaphor, our daily practice of communication is often less smooth. When something goes wrong, when for instance verbal communication fails, the frame of the conduit metaphor leaves open only one option: 'blame the speaker for failures. After all, receiving and unwrapping a package is so passive and simple – what can go wrong?' (ibid, 168) The conduit metaphor has no place for partially succeeded communication or of total miscommunication, based as it is on an abstract situation of unproblematic transport by a non-intervening transparent medium or channel. In short, it presupposes the possibility of ideal communication, of total immediacy.

3.2 The toolmakers metaphor

However, Reddy does not stop at describing the conduit metaphor and the frame conflicts it induces in daily practices; he sets himself to devising an alternative frame, which he dubs *the toolmakers paradigm*.¹³

Contrary to the conduit metaphor the toolmakers paradigm highlights the *transformation* processes involved in communicating messages. This paradigm is based on a quite different conception of what an idea is. As far as an idea might exist inside someone's head, this is always determined by and dependent of the direct environment of that person. The paradigm is based on what Reddy calls 'the postulate of radical subjectivity': you only have tacit knowledge about your own environment, you have no access to other people's environment, you only know of their existence indirectly, by cumulative series of inferences, i.e. by mediated communication.

Reddy provides a picture to illustrate how we should conceive this situation:

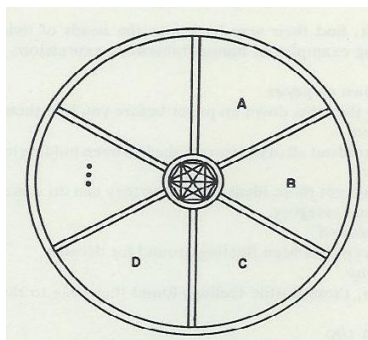


Figure 2: *The toolmakers paradigm* (from: Reddy 1994 [1979], p.172)

The picture displays a kind a wagon wheel, with spokes as the impermeable walls between isolated people. Each person is living in it's own compartment, where they have to survive with what is at hand. Their respective environments have things in common – say: water, rocks, trees, plants and the like – yet no two are exactly alike; some have more rocks, some have more trees and so on. At the hub of the wheel there is a kind of machinery which is able to deliver small sheets of paper from one environment to another. Somehow the people have learned to operate this machine to exchange crude sets of instructions, instructions for making

¹³ Lakoff and Johnson (1980) and Lakoff (1993) only address Reddy's description of the conduit metaphor, not a word about his toolmakers alternative. This can be explained by their focus on unconscious dead metaphors, but anyway by ignoring the alternative proposal they also ignore discursive competition between metaphorical frames, i.e. the politics of metaphor.

tools, shelters, food and so on. That's the only way to communicate; they have no way of visiting each others compartment, neither of exchanging samples of their products and tools. This model, Reddy suggests, frames more accurately the way daily communication works.¹⁴ Here, ideas can never flow freely and unchanged from one head or context to another. Ideas are idiosyncratic tools within a specific compartment, and have to be worked upon by inferences and transformations – both by the sender and the receiver - to make them applicable in other domains. To exchange such ideas/tools they have to be translated onto sheets of paper, and the interpretation of these sheets keeps inducing puzzlement, trial and error, and new adaptations. Here, there is no success without effort.

The transformation processes involved, completely deprented in the conduit metaphor, need human effort to take place: cognitive labor (consisting of cumulative series of inferences about another persons mode of existence and environment), toolmaking labor (creating your own tools in order to survive in your compartment, and adapting the tools of others), and translation labor (transforming your tools into applicable instructions for others, interpreting the instructions from others into applicable tools for your own environment).

To parse this frame in terms of conceptual metaphors: IDEAS ARE TOOLS, MESSAGES ARE TRANSLATIONS, and COMMUNICATION IS LABOR.

In this frame there is no transference without transformation, signification and interpretation. The ideas/tools change along with their translations into messages. This metaphor explicitly leads to questions of what tools are involved, what they are made of, what inferences has to be made about other's environments, how to relate instructions to applicable tools, how ideas/tools are conceived, externalized, probed, adjusted, modified, and translated in order to be transferred to other domains. It should be clear that all these questions can not even occur in the frame of the conduit metaphor.

Of course, the toolmakers metaphor also conceals elements. Take for instance that mysterious machinery in the middle of the wheel. It is apparently a kind of media machine, it probably stands for language or communication as such, but how did it get there? How could such a collectively shared system emerge between people who are not working and living together in shared habitats? The toolmakers metaphor has no narrative about that part.

There is no metaphor which does not conceal or downplay certain elements, as we have learned from Lakoff and Johnson. This holds for both the toolmakers and the conduit metaphor – in the latter the transportation/media machinery is so taken-for-granted that the narrative does not even bother to state mysterious assumptions, as does the toolmakers narrative.

In any case, we may conclude that the toolmakers metaphor opens up quite a different discourse than the conduit metaphor. In that sense these metaphors can indeed be called *discourse metaphors* (Zinken et al. 2005). Discourse metaphors are narrative abbreviations of complex composites of inferences, assumptions, and metaphorical concepts which constitute together a more or less coherent disciplining discourse of truth. Such metaphors frame and organize shared narratives (be it in the form of public opinion, political agendas, research programs, or world views) yet most of all they organize and install norms. They do so by highlighting certain aspects while downplaying others, by deciding what is relevant and what not, by assigning candidates for truth and falsehood, by legitimatizing and favoring certain questions and derivations, and disqualifying or ignoring others (Hacking 2002, Foucault 1971).

Discourse metaphors should be distinguished from Lakoff and Johnson's conceptual metaphors, since discourse metaphors arrange sets of conceptual metaphors in a systematic coherent narrative. In ordinary language we can discern more conceptual metaphors about the ontology of ideas, for instance IDEAS ARE PEOPLE, IDEAS ARE ORGANISMS, IDEAS

¹⁴ Reddy does not explain why he speaks of the toolmakers *paradigm* as opposed to the conduit *metaphor*. Both provide discursive frames, both highlight and downplay elements, both are metaphorical assemblages. Reddy seems to imply that metaphors can not be as accurate as paradigms.

ARE FOOD, IDEAS ARE COMMODITIES. Corresponding common expressions - usually not recognized as metaphorical articulations - would then be respectively: 'Cognitive psychology is still in its infancy', 'This is a fertile idea', 'I can't swallow that claim', 'He won't buy that'. But none of these conceptual metaphors are connected to other conceptual metaphors in a systematic narrative, as is the case in the conduit and the toolmakers metaphor. These two metaphoric models thus regulate frames of discourse about communication, by assembling sets of conceptual metaphors, and thereby opening and closing different paths of thinking and posing questions. As such they organize discursive formations of knowledge and power, and turn epistemology and ontology into politics.

3.3 The battle over discourse

It would be tempting to state that, considering its prevalence in ordinary expressions, the conduit metaphor is clearly the dominant discourse metaphor, but that would ignore daily experienced frame conflicts and the politics of metaphor. Discourse metaphors are always contested, any hegemony is constantly challenged. This can be done by questioning the derivations of a conceptual metaphor, by introducing alternative conceptual metaphors, or by proposing a complete alternative metaphorical narrative, as did Reddy. The battle over discourse is perpetual.

Reddy already pointed at frame conflicts in ordinary speech by lay people, and Hayles (1999) did in fact the same for expert discourses on communication when she revealed the discordant emergence of the sender-receiver model in early information theory (cf. Shannon and Weaver 1998 [1949]). Though the sender-receiver model did explicitly address the problematics of the channel (conduit), it did so only in statistical terms of signal/noise ratio, thereby all the more installing the idea of disembodied stable information which has to be pushed through a non-distorting channel. The sender-receiver model thus can be seen as the engineering variant of the conduit metaphor. Eventually, this discourse became the dominant paradigm in cybernetics, but not without contesting toolmaker advocates, stressing the materiality and meaning of information, as Hayles showed so convincingly.

In the genealogy of communication and media studies we can also discern the battle between the conduit and the toolmakers paradigm. Media studies have made a perspective shift from a conduit paradigm - assuming passive receiving masses who just unpack the message as sent by powerful mass media - towards more toolmaker inspired notions of context and code (Jakobson 1960) coding and decoding by social cultural groups (Hall 1973), active and interactive audiences (Fiske 1987, Jenkins 1992) and media as practice (Couldry 2004). Though this might look like a linear historical sequence towards the final triumph of the toolmakers paradigm, it should be noted that the two discourse metaphors are still both in the game. And probably they always will be there, conflicting and contesting, or co-existing and even cooperating. Be it between different schools of research or different discourse communities, or within the same school, community or even theory.

For instance, we might say that the research paradigms of social constructivism or deconstructivism (Chang 1996) are framed by the toolmakers metaphor - though clearly with a more social conception of subjectivity, culture and habitat - while Enlightenment projects such as Habermas theory of communicative action, outlining the ideal conditions of democratic dialogue between equals, are more framed by the conduit metaphor.

We can even find examples of theories which can be seen as hybrids of the conduit and the toolmakers metaphor. Take for instance Bolter and Grusin's (1998) notion of 'remediation' as the oscillation between the mediation strategies of transparent immediacy and hypermediacy. This notion combines the conduit discourse of immediacy with the toolmakers discourse of awareness of translations, transformations and transmediations.

Regarding digital networks, especially the Internet, we see the same metaphorical discourse dynamics at work. The classic conceptual metaphor of the 'electronic highway' has been

criticized for its quasi-apolitical disembodied conception of information transport, and its blending of metaphors into a specific political frame (Rohrer 1997, Van den Boomen 2005). And though alternative conceptual metaphors like 'electronic frontier' and 'cyberspace' seem to allude more to toolmaker and survival concepts, they are also marked by the disembodied, unrestrained and universalist conduit metaphor (Wyatt 2004, Van den Boomen 2005). Contrary to the apparent takeover by the toolmakers paradigm in media studies, the dominant discourse about digitality and the Internet seems to be deeply saturated by concepts from the conduit metaphor. The click & go discourse is very strong, not only in the context of plain marketing and advertising, but also ordinary speech. Easy access, with the speed of light, always-on, always available, always your friends at hand, your mail in your pocket, your global position on a screen – it is all about instant immediacy, provided by the ubiquitous conduit metaphor. At the same, we know of the frame conflicts. We know how vulnerable the conduit actually is. When our mail is just not there, when our printer does not work, when our screen turns blue, when our connection is disrupted. Then we switch to the toolmakers metaphor - we call upon experts, friends or hackers, or we decide to be our own toolmaker. We keep on switching between metaphors, and we keep on forgetting we do.

Baudrillard (1983) once made the gloomy assertion: 'The cool universe of digitality has absorbed the world of metaphor and metonymy.' While Baudrillard usually has a keen eye on the explosion and implosion of signs, he could not have been more wrong. I would say, on the contrary, the universe of metaphor and metonymy has absorbed the cool world of digitality.

4 Concluding remarks

I have tried to show how contemporary networked communication is thoroughly mediated by metaphors, on several levels. Metaphors do not only help us in making sense of complex situations, they operate and act according to their own dynamics. This dynamics stretches far beyond individual users and their computing and clicking operations; they stretch into material and symbolic networks, into discursive formations, and society as such. In order to disentangle the material-semiotic movements involved in daily Internet practices – seduction into iconology, the desire for immediacy, and transferences/transmediations between different kinds of networks – and follow their connections to broader material and discursive formations, I proposed a distinction between three kinds of metaphors: conceptual metaphors, material metaphors and discourse metaphors. While this enables us to give a more inclusive account of the intricate cooperations going on between human and machine information processing, a lot of black boxes are still waiting for ontological and epistemological hacks. While material metaphors provide epistemological apertures into black boxed machine processes, the precise interplay between material metaphors and discourse metaphors remains a field to be explored further by media and communication scholars.

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