

## DISRUPTIONS. MEDIA STUDIES (BERLIN STYLE)

[Proposal for a talk within the panel *German media theory in the field of communication studies: Stranger, guest, collaborator?* (proposed by Kęstas Kirtiklis / José Gomes-Pinto) at the ECREA European Communication Conference, October 31 - November 3, 2018 in Lugano, Switzerland; including parts of a former presentation for teaching staff of diverse "Communication Studies" at Norwegian universities, Humboldt-University]

### **Two waves of German Media Studies close to technology**

While a first school of "Medienwissenschaft" in Germany arose in the 1970s at places like the (notably) *Technical University* of Berlin, heavily inspired by the epistemology of cybernetics and by the British Cultural Studies with its *methodological* focus on mass media effects as a "cultural form"<sup>1</sup>. Friedrich Knilli there acquired a costly AMPEX 1000A Two-Inch-Tape based video recorder, since for "live" television programs to be academically (that is: slowly) analyzed it required its recording for deferred and time-axis-manipulated replay. Video recording thus turns out as a technological *a priori* for analyse which makes Television Studies (just like the emergent Film Studies) into a scientific method (*Fernsehwissenschaft*).

It has since been Friedrich Kittler who became the discourse-generator of a second generation of the German way to study media "by focusing on the material and technical aspects of their operation - <...> the cornerstone of the materialist approach now widely referred to as German media theory"<sup>2</sup>. Characteristic for that approach is that it takes both the materiality and the mathematics (logics) of (especially computaitonal) media into account - a litteral interpretation of techno/logy as being derived from ancient Greek *techné* and *lógos* (which is not just words for communication and discourse but numerical ratios as well).

Media is understood here as physical or artificial techniques of communication. Computing transforms cultural artefacts into digitized data, rendering them to networking and interaction and thereby creating new cultural practices. Media are being treated within a decisively academic analysis which keeps their epistemological reflection open for future transformation.

### **German "media theory" *avant la lettre***

In his *Grundlagen einer Philosophie der Technik* (1877), Ernst Kapp introduced the term "Organprojection" - a remarkable anticipation of McLuhan's prosthesis-theory of media when finally comparing telegraphy networks to the human nervous system itself.<sup>3</sup>

1 See Raymond Williams, *Television. Technology and Cultural Form*, London 1975

2 Rory Solomon, *Last in, first out. Network Archaeology of / as the Stack*, in: Amodern 2: Network Archaeology (2013), online <http://amodern.net/article/last-in-first-out> (accessed October 2013)

3 Kapp himself later emigrated to the USA; so far there seems no archival evidence for a direct influence of Kapp on McLuhan. An

Sigmund Freud's notion of the Unconscious (the "psychischer Apparat") somewhat antedating the French Apparatus approach (Baudry on the cinematic *dispositif*).

Furthermore, Walter Benjamin sees human perception shaped by the variant historic media conditions. Close to what Marshall McLuhan later termed "the medium is the message" he interprets film not in its content but rather as a setting like a physiological experimental laboratory: "Das Publikum fühlt sich in den Darsteller nur ein, indem es sich in den Apparat einfühlt. Es übernimmt also dessen Haltung: es testet." The dramaturgy of "choque" accommodates the audience on the perceptual level to the speed of modernity and time-critical moments. This phenomenon has been investigated further by Paul Virilio's "dromology" which (like Heinrich Heine in his famous thesis of the annihilation of time by the new transport vehicle railway around 1840) swallows spatial distance in favour of the temporal trajectory (tele-presence).

This diagnosis has been shared by Martin Heidegger's notion of annihilation of distance ("Entfernung") by radio and television. Heidegger's philosophy of technology is an epistemological rather than engineering view ("Das Wesen des Technischen ist nichts Technisches"). Heidegger, after his post-war prohibition of teaching at university, still lingered as a ghost in the gang-ways of Freiburg university, inspiring a young generation of Friedrich Kittler, Norbert Bolz et al. just like by the neighbouring French post-structuralists (Lacan, Foucault, Derrida).

## **The Berlin model: *Kulturwissenschaft* and Media Studies in critical alliance**

Parallel to the emergence of "Medienwissenschaft" (written in singular) as a proper academic discipline in German universities, "Kulturwissenschaft" arose as a field of research inspired by Aby Warburg et al.; especially with the re-organization of Humboldt University after the fall of the Berlin Wall in the beginning of the 1990s, "Kulturwissenschaft" as a discipline (written in the singular) developed a sharp methodological edge, orientated rather towards "Kulturtechniken" (cultural engineering) with projects like "Bild - Schrift - Zahl" and "Das technische Bild" (research projects at the interdisciplinary "Helmholtz Zentrum für Kulturtechnik").

Anong the protagonists of "Kulturwissenschaft", Hartmut Böhme once defined the disciplinary matrix of "Kulturwissenschaft" in a way which claims to include (or absorb) "Medienwissenschaft", arguing for a "interdisziplinäre Kulturwissenschaft mit offenen Augen für die Geschichte der technischen Welt"<sup>4</sup>. Wolfgang Frühwald rephrased this with a significant shift of emphasis (which has become the *credo* of the GfM in the meantime): a "*kulturwissenschaftlich orientierte Medienwissenschaft*"<sup>5</sup>. This perspective is

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intermediary is Lewis Mumford, xxx

<sup>4</sup> Böhme 1989: 30

<sup>5</sup> Wolfgang Frühwald, Geisteswissenschaften heute. Eine Denkschrift, Frankfurt/M. (Suhrkamp) 1991, 156

critical. While cultural studies (including research on the technological impact) tend to reduce media to its discursive effects rather than knowing media as technologies themselves (except a few scholars like Christian Kassung and others), media studies proper require a sound techno-mathematical and media-archaeological (-historical and -theoretical) knowledge and exercises how to develop epistemological questions out of that close knowledge.

### **"Understanding media" with ears**

While most German media studies have originated either from philology (Germanistik) or from Theater and/or Film and Television studies, there has been a neglect of the auditory channel of communication. Finally, the special alliance between musicology and media archaeology<sup>6</sup> at the Humboldt University Institute for Musicology and Media Science leads to a special emphasis on "sonicity" as its structural link: time-based signal processing.

### **The different meanings of "communication" in (German) Media Theory**

German Media Theory is characterized by its combination of close analysis of media technologies with deep philosophical questioning of such evidence. It rather stays close to the signal than to cultural and communicative semiotics. This peculiar mix of fascination with engineering together with epistemological reasoning leads to a radical shift of focus of attention to communication not between humans but within machines. 99 % of the "media event" occurs *within* technologies, unnoticed by humans in their interfacial use of "social" communication devices - more than ever in times of mobile media.

Media-archaeological investigation does not aim at reconstructing the relation between communication studies and German media theory in terms of history of academic discourse but rather concentrates on the epistemological points of "dis/agreement". Moments of radical divergence is Shannon's "Mathematical Theory of Communication" (1948) as well as McLuhan's "understanding" of media (1964) which started in communication studies but turned it upside down into a core moment of emerging Media Studies proper. In addition, the "take-off" of German Media Theory has been a radical technological *grounding* of French (post-)structuralism (Lacan, Foucault). The "Berlin school" develops a radical media archaeological and -epistemological approach, which rather enhances the incommensurability between communication and media studies.

Whereas communication studies are mostly concerned with the mass media transmission of such events, media archaeology poses the question of the "origin" of operative media on a deeper level, which is the technomathematical one - in the sense of the mathematical square root which is the symbolic expression of the verbal notion of *arché*). The Deleuzean equivalent is the bio-systematic trope of *rhizome*.

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<sup>6</sup> See Friedrich Kittlers monumental work on *Musik und Mathematik*, resulting in the volumes *Aphrodite* and *Eros* , Munich (Fink) 2006 / 2009

The media-epistemological focus is on what unfolds *within* that bracket / *epoché* (which escapes phenomenological, anthropocentric communication or "media" studies): "It was with good reason that Shannon's information theory [...] categorically distinguishes between the receiver and the recipient of the information, that is, the radio set und listeners - because he wanted to be able to leave the recipient out of the mathematical theory altogether."<sup>7</sup> True *media*-understanding gets epistemologically attuned to the technological inbetween which has transsubstantiated from Aristotle's *to metaxy* as physical channel of communication (water, air) to technologically adopted electro-physicality, different from the media-phenomenological focus on interfaces as human media experience.

While German Media Studies (even media "science") emerged rather abruptly in the final quarter of 20th century, it has no prehistory but rather diverse epistemological roots in German thinking like Kapp's *Philosophie der Technik* 1877, Benjamin's approach to technical reproduction (1936), Heidegger's concept of the technical "turn", while at the same time being heavily influenced by Anglo-American theory of media engineering (Turing, Shannon) and French thinking like Lacan's equation of the human subconscious with the machine, and Foucault's rigid discourse analysis.

While communication studies with a sociological impact have been prominent in 20th century academic research (represented in the German speaking world by the Frankfurt School "Critical Theory" with Adorno and others), German media theory has emerged from the necessity to answer material questions rarely posed by communication studies. The "speculative nature" of "German theorizing" (as expressed in the cfp) rather links it to Object-Oriented Ontology than to manifest media content research. German media theory starts from a different concept of communication: understood not in the sociological but engineering sense (Claude Shannon 1948), with "information" being a mathematical ratio rather than a semiotic negotiation of discourse.

The very term "communication" is the point of bifurcation between media science and communication studies. In communication engineering, "[t]he concept of information applies not to the individual messages (as the concept of meaning would), but rather to the situation as a whole"<sup>8</sup>; mathematical calculation measures the temperature of communication, that is: the amount of freedom of choice in selecting a message (its entropy).

Information theory arose under the pressure of engineering needs: the efficient design of electronic communication devices (telephone, radio, radar, and television) depending on achieving favorable 'signal-to-noise ratios'. "Application of mathematical tools to these problems had to wait for an adequate formulation of 'information' as contrasted to 'noise'. If noise is defined as random activity, then information can be considered as order wrenched from disorder; as improbable structure in contrast to the greater probability of randomness. With the concept of entropy, classical

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<sup>7</sup> Friedrich Kittler, Observations on Public Reception, in: Radio Rethink. Art, Sound and Transmission, ed. by Daine Augaitis / Dan Lander, Banff (Walter Phillips Gallery) 1994, 75-85 (75 f.)

<sup>8</sup> Weaver 1949 / 1963: 9

thermodynamics expressed the universal trend toward more probable states <...>. Information can thus be formulated as negative entropy, and a precise measure of certain classes of information can be found by referring to degrees of improbability of a state.<sup>9</sup>

## Message or noise?

If communication is understood in cybernetic terms, it is not restricted to bridging space but opens a temporal horizon, allowing for anticipating the future by predictive algorithms: "The receiver's reaction can actually be observed (and thus cause corrections with the sender) or it can be anticipated. For the latter case of influence on the signal production by the sender's assumptions about potential effects the term *feedforward* has also been suggested."<sup>10</sup> This scenario is not about mutual understanding but about signal circulation in coupled systems, be it man-man, man-machine, or machine-machine(s). Its media-archaeological primary scene has been the Anti-Aircraft Prediction in Second World War and the Anti-Missile program in the Cold War, as developed in parallel lines by Norbert Wiener (with Bigelow) and by Claude Shannon.<sup>11</sup>

Shannon developed techno-mathematical enemy aircraft movement anticipation, where the human factor (the pilot's intentional manoeuvres) is superseded and limited (corrupted) by the mechanical behaviour of the airplane and other physical parameters<sup>12</sup>

Norbert Wiener developed his applied time series analysis in the context of tactical *anti-aircraft prediction*. In this model the real die position of the enemy airplane at the temporal moment  $t$  is considered the "message", whereas registered deviations represent "noise".<sup>13</sup>

Analog and digital communication, based on continuous signals or discrete symbols like telephone talks and archival lectures can be mathematically correlated: "This is the study of messages, and their transmission, whether these messages be sequences of dots and dashes as in the Morse code or the teletypewriter, or sound-wave patterns as in the telephone or phonograph, or patterns representing visual images as in telephoto service and television. In all communication engineering <...> the message to be transmitted is represented as some sort of array of measurable quantities distributed in time. <...> by coding, or the use of the voice, or scanning, the message to be transmitted is developed into a time series" = Norbert Wiener, 1942, The

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9 Heinz von Foerster / Margaret Mead / Hans Lukas Teuber (eds.), *Cybernetics. Circular causal and feedback mechanisms in biological and social systems.* Transactions of the Ninth Conference March 20-21, 1952, New York, N. Y., New York (Macy) 1953, "A note by the editors", xiii

10 Winfried Nöth, *Handbook of Semiotics*, Stuttgart 1990, 178

11 As described in Axel Roch, *Claude E. Shannon. Spielzeug, Leben und die geheime Geschichte seiner Theorie der Information*, Berlin (gegenstalt Verlag) 2009

12 See Axel Roch / Bernhard Siegert, xxx, in: Schade / Tholen (eds.), xxx

13 P. R. Masani, *Norbert Wiener 1894-1964*, Basel / Boston / Berlin (Birkhäuser) 1990, 186

Extrapolation, Interpolation und Smoothing of Stationary Time Series with Engineering Application, Typoskript datiert auf den 1. Februar 1942, 3: National Archives and Records Administration, Record Group 227 (Office of Scientific Research and Development), College Park, Maryland (USA), MFR, DIV.7-313.1-M2. Siehe Roch 2009: Kapitel 2.4 "Statistik gegen Geometrie", 61 ff.

## The logos of the machine: Non-human communication

Media archaeology is both a research method in media studies, and an aesthetics in media arts. It addresses the non-human procedures which happen and / or "communicate" in media technologies themselves.

The term "non-human" is taken here in a double sense: First of all, it hypothetically means the point of view of the machines, being a kind of "inhuman hermeneutics". And second, as can be demonstrated by the use of the term "communication" in Claude Shannons "Mathematical Theory of Communication" from 1948<sup>14</sup>, it relieves the notion of "information" from all semantic meaning. In that sense, a transmitter of radio waves "communicates" with the radio receiver, or computers communicate in-between in the Internet. Not the quality of information counts, but it is taken as a quantitative measure, both in the statistical sense and in information theory.

"The word *communication* will be used here in a very broad sense to include all the procedures by which one mind may affect another. This, of course, involves not only written and oral speech, but also music, the pictorial arts, the theatre, the ballet, and in fact all human behavior. In some connections it may be desirable to use a still broader definition of communication, namely, one which would include the procedures by means of which one mechanism (say automatic equipment to track an airplane and compute its probable future positions) affects another mechanism (say a guided missile chasing this airplane)."<sup>15</sup>

Marshall McLuhan (1964) rather analyzed the media technological message than its discursive "content" which he even dismissed as diverting critical attention. Economist Harold Innis focused on the *bias* of communication; its underlying orientation towards conquering either time (alias tradition) or space (alias telecommunication) is no metaphysical or social construction, but a function of its material or logical techniques.

Bertolt Brecht's "radio theory", around 1930, clearly underlined that it takes technical intervention to prevent the radio from becoming a passive consumer device; only by activating the feedback channel, radio can be turned into a literal "communication device".

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<sup>14</sup> Claude E. Shannon, The Mathematical Theory of Communication, in: Bell System Technical Journal 27, Juli/Okttober 1948, 379–423 / 623–656

<sup>15</sup> Warren Weaver, Recent Contributions to the Mathematical Theory of Communication, in: Claude Shannon / same author, The Mathematical Theory of Communication, Urbana (University of Illinois Press) 1964, 1

Audio communication, at the Berlin Technical University, therefore explicitly underlines: "An der Technischen Universität Berlin hingegen befasst sich die Kommunikationswissenschaft mit den naturwissenschaftlichen Grundlagen von Sprache und Musik."<sup>16</sup>

Even without any human being involved, communication takes place: "the procedures by means of which one mechanism (say automatic equipment to track an airplane and to compute its probable future positions) affects another mechanism (say a guided missile chasing this airplane)", Warren Weaver declares in his "Introductory Note on the General Setting of the Analytical Communication Studies <sic>".<sup>17</sup>

Almost by techno-logical necessity, Thodor W. Adorno's analysis of music in radio culture *Current of Music*, which stays close to the signal, once became incompatible with the communication studies of the "Princeton Radio Research Project" directed by Lazarsfeld.

The electromagnetic spectrum is made up of many kinds of waves most of which do not concern mass communication media.

In "analog days", the limited of "radio" frequencies which can be squeezed in to a frequency band seemed to limit the expansion of communication media.<sup>18</sup> So-called *cognitive radio* (time hopping, frequency hopping, once developed by Hedy Lamarr and George Antheil against interception of radio communication based on punched tapes known from music automata) has been the answer, as well as asynchronous transfer. Digitization radically multiplied channels for transmission, which implies a radical transformation in the ontology of communication: its mathematization and algorithmization.

Paul Baran and Donald Watts, in 1963, develop *packet switching* as disentangled, in fact: literal de-construction of syntactically coherent communication; Bob Kahn's and Vinton Cerf's Transmission Control Protocol (TCP), later accompanied by Internet Protocol (IP), radicalize the postal epoch of address orientation; mighty compression and even predictive algorithms transform time-consuming into an almost immediate transmission. What looks like the return of face-to-face communication on the phenomenal surface for humans (technically true for time-continuous "live" transmission in analog electronic telecommunication), in fact is more non-linear (time-discretely temporalized) by nano-temporal calculation intervals than ever.

Especially with fiber optical cables for financial high frequency trading, networked locations can be addressed with the speed of electricity; digital immediacy replaces the still energetically biased notion of "mobile" transfer.

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<sup>16</sup> <http://www.tu-berlin.de/zuv/asb/faecher/komm/komm.html>

<sup>17</sup> In: C. E. Shannon / W. Weaver, The mathematical theory of communication, Urbana, Ill., 1963, 3-28 (3)

<sup>18</sup> D. Q. Innis, A Note on Communication and Electromagnetic Resources, in: Harold A. Innis, The Bias of Communication, Toronto / Buffalo / London (Univ. of Toronto Press) 1995, Appendix I, 199-202 (201f)

The essential message of von-Neumann architecture in current computing is algorithmic thinking and the stored program. To learn from the McLuhanite method is to resist the temptation of submerging the analysis of current media culture to the media-sociological approach which looks at the figurative *Medienwirkung* (the social phenomena) first; media-archaeological analysis instead identifies the deep impact of a current media system which McLuhan call it, according to the *Gestalt* approach in psychology, the "ground". The ground of electronic communication has been "acoustic space" (McLuhan) not in its manifeste, but epistemic sense. The classic "analogue" model of mediated communication which has been channel-based transmission (tele-communication in the spatial sense, tradition in the temporal sense) is currently under-tunneled by mathematically sophisticated data compression, calculating "real time" effects by means of statistical anticipation of immediately future events. The techno-logics of Internet communication replaces the cultural time-biased formation called "tradition" (in its fixation on the temporal channel) into a dynamic archive, with its primacy of techno-mathematical coding. Emphatic transmission (across spatial distance) by a channel is undone (or counter-matched) by pre-emptive mathematical calculation on the one hand, and re-placed by a thick net of micro-transmissions within processors.

Media archaeology tries to precisely locate the technological momentum where communication actually takes place: its material agencies. In the binary code of earely electric computing, e. g., the thermionic tube (triode) functions in the discrete mode, different from linear amplification in telephone lines technology.

#### [Artefact]

This different bridging of distances by binary quantities results in a new quality: "The network became machine. No longer was the network a passive device, for repeater amplifiers actively added energy along the route. This change decoupled the wave that represented the conversation from its physical embodiment in the cable. <...> Electricity in the wires was now merely a carrier, separate from the message or signals it carried <...>. Now voices becomes signals <...>. The message was no longer the medium; now it was a signal that could be understood and manipulated on its own terms, detached from its physical embodiment."<sup>19</sup> Already Siemens *regenerative repetitor* in electric telegraphy (the 19th century Indo-European Telegraph Line) did not amplify with signals as well the noise, but clearly differentiates binary *digits*.

#### [Artefact]

Information replaces energetically continuous time-signal in favor of time-discrete pulses. Thereby the US-American Bell System which started with telephony "became not merely a set of voice channels but a generalized system capable of carrying any signal as a new currency: information"<sup>20</sup>, transcedning communication in the narrow human sense.

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19 David A. Mindell, Between Humans and Machine. Feedback, Control, and Computing before Cybernetics, Baltimore / London (Johns Hopkins University Press) 2004, 112

20 Mindell 2004: 107

## **Message, message: McLuhan's difference to Communication Studies**

Although Marshall McLuhan is currently being re-discovered as a thinker of "social media" *avant la lettre* within the Internet community, the main lesson to take from McLuhan is still to look behind the computer screens, for a not content-orientated, but hidden message-orientated analysis. This requires - with and beyond McLuhan - a structural analysis of the techno-mathematical conditions of current media practices, to bring out the epistemological layers of such practices.

The message beyond McLuhan's grave is a critical awareness for media-induced phenomena acting upon humans in implicit ways. McLuhan has inspired neurological studies into mass media perception, that is: the awareness of subliminal processes induced by technical (mechanical and electronic) media such as later experimented by Herbert E. Krugmann's "Brain Wave Measures of Media Involvement"<sup>21</sup>. McLuhans seminal book *Understanding Media* originally did not result out of interest in media-epistemological theory right away, but originated more traditionally in communication studies. *Understanding Media* had been commissioned as an educational report to analyze the impact of watching television on school children. It was "absolutely McLuhan" to turn this study upside down, resulting in a most original analysis of the deep impact of media on human perception on the subliminal level. Understanding media is not about content, but the *message* and *massage* of the medium: the affective, neurological level, analogous to the figure/ground separation as developed in *Gestalt* psychology.

Early 20th century artistic avantgardes have been triggered by media technologies such as chronophotography and film. As has been pointed out by Clement Greenberg in his writings on art (and later by Michel Foucault in his interpretation of Manet), modernist painting itself has discovered the grounding materiality of the rectangular canvas as the principal message. According to McLuhan who developed this insight further, it is the media-archaeological task of the artist to un-cover such a ground (like according to Martin Heidegger it is the philosopher's task to reveal forgotten ontological substrata), and to communicate these insights in anticipation of what only belatedly becomes apparent to society.

McLuhan's insistence on the ground / figure difference can be interpreted as the difference between the media-archaeological layering of media against their phenomenological (mass) media appearance on the level of interfaces and other surfaces.<sup>22</sup> This can be extended into the temporal domain, where frequency is the mathematical reversal of physical oscillations. High frequency carriers channels in tele-communication are being modulated by the varying low frequency articulations known to human perception as sound, music or speech, figuring or in-forming the basically *temporal* ground of transmission. Media archaeology is not only about spatial and topological grounds, but as

21 Published in: Journal of Advertising Research vol. 2, no 1 (February) 1971, 3-9

22 Interfaces, though, may be treated different from traditional surfaces, since they represent a technical coupling.

well about the floating groundings: "Ground cannot be dealt with conceptually or abstractly: it is ceaselessly changing, dynamic, discontinuous and heterogeneous, a mosaic of intervals and contours."<sup>23</sup>

Having said this, though, McLuhan's focus on the message of the medium *as perceived by human senses* lacks an essential understanding of the inner processes in telecommunication technologies for the second half of the 20th century and since, which is based upon the technomathematical theory of information as developed by Claude Shannon 1948 in his "Mathematical Theory of Communication". McLuhan's critical, almost satirical reading of the Shannon diagram as a simple linear sender/receiver-relation reveals his essential ignorance of the mathematical reasoning involved in digital communication engineering; this makes all the difference between an analysis of the impact of mass media on audiences on the one side, and media archaeology on the other.

McLuhans critical comment on Shannon's communication diagram is a disastrous simplification of its mathematical understanding. In his 1978 essay "The Brain and the Media. The 'Western' Hemisphere", McLuhan attributes the Shannon-Weaver model of communication to the predominantly left-hemispheric Gutenberg galaxy.<sup>24</sup> "The Shannon-Weaver model of communication <...> typifies left-brain lineal bias. It is a kind of pipeline model of a hardware container for software content. It <...> assumes that communication is a kind of literal *matching* rather than resonant *making*"<sup>25</sup> - which reveals McLuhan's kind of "analogue thinking" from the electronic media age (thus being closer to the analogue computer indeed). As has been expressed by a follower of McLuhan, the radio scholar Tony Schwartz: "Electronic media have been viewed merely as extensions of print, and therefore subject to the same grammar <...>. The patterned auditory and visual information on television or radio is not 'content'. Content is a print term <...> As stimuli, electronically mediated communication cannot be analyzed in the same way as print 'content'."<sup>26</sup>

Can such an interpretation of electronic mass media still be applied to an analysis of the algorithms which rule digital communication media and scholarly research in times of Digital Humanities? McLuhan's brother in mind Schwartz continues: "The function of a communicator is to achieve a state of resonance with the person receiving visual and auditory stimuli from television, radio, records, etc. Decoding symbolic forms such as <...> written words is no longer our most significant problem. They extract meaning from perception in a manner prescribed by the structure of the language, code this meaning symbolically, and store it in the brain. But the brain does not store everything in this way. Many of our experiences with electronic media are recorded and

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23 Marshall McLuhan / Eric McLuhan, *Laws of media. The new science*, Toronto (University of Toronto Press) 1988, 63

24 As quoted in: Peter Bexte, Cadillac und Gebetmatte. McLuhans TV-Gemälde, in: Derrick de Kerckhove / Martina Leeker / Kerstin Schmidt (eds), *McLuhan neu lesen. Kritische Analysen zu Medien und Kultur im 21. Jahrhundert*, Bielefeld (transcript) 2008, 323-337 (335)

25 Marshall McLuhan / Eric McLuhan 1988: 86

26 Tony Schwartz, *The responsive chord*, Garden City, New York (Anchor books) 1974, 19

stored in the same way that they are perceived. <...> since the experience is not stored in a symbolic form, it cannot be retrieved by symbolic cues."<sup>27</sup>

But it is an almost Hegelian irony of technological reason in the history of cultural engineering, that what looks like non-symbolic (and rather signal-based) audiovisual media, in the epoch of digital communication re-turns in an even more rigid symbolic order. The implicit message of the meta-medium computer is that all former media (especially the signal-based ones) are symbolically transformed from distinct hardware to software, thus: software formats.<sup>28</sup>

A first step in symbolic coding had been spoken language, then writing (especially the phonetic alphabet); these cultural technologies have since been more or less immediate to the human processor. Nowadays though, the alphanumeric programs remain hidden to most users.

### **By-passing the human-machine interface**

Media archaeology as "critique" does not proceed by analysis of media content (which is the task of media sociology and communication studies) but means critique of the kind of ideology which is inherent in hard- and software, in the best tradition of French *Apparatus* theory (Baudry et al.).

"Most approaches to "new media" emphasize one side of the screen or the other; [...] the screen divides new media studies into visual culture studies and media archaeology. Visual culture studies stem from the Anglo-speaking academy and generally treats the interface, or representations of the interface, as the media (or filmic/televisual/print representations of this interface). [...] media archaeology, although inspired by Marshall McLuhan and Michel Foucault, is mainly Germanic", Wendy Chun remarks, and further: Media archaeology "concentrates on the machine and often ignores the screen's content. Archaeological studies critique visual culture studies' conflation of interface with medium, representation with actuality; visual culture studies critique the archaeologists' technological determinism and blindness to content and the media industry"<sup>29</sup>.

To apply this argument to audio media, especially to short wave AM radio, the apparent dichotomy turns out to be rather interlaced. When listening to a broadcast from Radio Kuwait in the early evening, the noise and the phase shifting are an articulation of the ionospheric channel of transmission (i. e. the "medium" in Shannon's sense) itself; the medium here is part of the message which, though, only becomes perceptible when being part of a successful reception of content.

As a compromise between content-orientated mass media studies and hard core media archaeology, media theorists like Lev Manovich created "software

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27 Schwartz 1974: 24

28 See Stefan Heidenreich, *FlipFlop. Digitale Datenströme und die Kultur des 21. Jahrhunderts*, Munich / Vienna (Hanser) 2004

29 Wendy Chun, *Communication in the age of fiber optics*, xxx, Introduction

culture" studies. Manovich finds it impossible now to separate between the cultural and the technical level in or rather "on" the computer; let us, here, interpolate the term "cultural engineering" which links both.

The recent debate about the US-American PRISM data surveillance system reminded of the necessity for Time-Critical Media Studies in both senses of "time-critical": in the sense of political analysis and in the most precise "forensic" (Matthew Kirschenbaum) hard- and software sense which is the media-archaeological level of analysis. Obviously, PRISM refers to the fiber glass cable which links Continental European to British and US-American data transfer. "Big data traffic", as expression, has replaced "mass media communication". Such a cable can "read" in terms of symbolical (binary) data processing.

"Software studies" (Matthew Fuller et al.) does not reduce analysis to discourse, but critically looks at the algorithms and their embeddedness in Hardware structures themselves.

### **Obscuring media technologies: Online communication and "cloud computing" as challenge to Media Archaeology**

Current cloud computing and mobile media challenge the original "technical a priori" focus on material computer platforms and source code. But different from communication studies of "social media", material media studies insists on "the media artefact at the centre of media-epistemological analysis.

In so-called "social media", the "social" in fact has become a function of nonhuman communication engineering. Even "cloud computing" still requires a close analysis of its underlying hard- and software, such as a reminder of the giant water cooling systems for hot data processing at the Google data centers in the European North.<sup>30</sup> In order not to let terms like "network" slip into pure metaphors, an analysis of its technical and logical infrastructure (which is optical fiber cables and protocols) needs to be as exact as the description of the electronic FlipFlop circuitry, as the very condition for "binary" computing.

Against precise analysis close to the infra-structural data logistics<sup>31</sup>, metaphors like the data "cloud" are literally obscuring, "cloudy" in both the thermodynamic and informational sense of entropy. The current fashion of so-called media-ecology puts a veil on the actual technological condition. Only a renewed *enlightenment* will - less allegorically - read the operative diagram of current Information Society like it used to open the black box of individual technologies so far. The *protocols* (Alexander Galloway) of Internet traffic are still there to be deciphered with media-philological competence in its most ancient sense of *logos*, that is: alpha-numerically.

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<sup>30</sup> Jennifer Holt / Patrick Vonderau, "Where the Internet Lives": Data Centers as Cloud Infrastructure, in: Parks / Starosielki (eds.) 2015: 71-93

<sup>31</sup> As argued in Shannon Mattern, Deep Time of Media Infrastructure, in: Parks / Starosielki (ed.) 2015: 71-93 - even if the author traps into the metaphors of the archaeological "excavation."

While hardware- and code-focused knowledge of ubiquitous computing is still vital, what additionally has emerged is the necessity to identify the operative temporality of the World Wide Web, like the time-critical "ping" signal and UNIX time, as well as a neo-cybernetic model of the coupling of humans to algorithmic devices. The everyday cyborg is loosely coupled to communication devices, while s/he (or "it") becomes tightly coupled to microchip implantations. The tablet computer or smart phone (the neo-German "Handy") is not simply *ready-to-hand*; like Martin Heidegger's "hammer" (in *Time and Being*) any more; computational communication devices in the permanent "online" mode rather subject the human to their proper, chrono-technical regime.