MEDIA STUDIES: MEDIA ARCHAEOLOGY AS SPECIFIC METHOD AND MEDIA TEMPORALITIES AS OBJECT OF SONIC KNOWLEDGE

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I MEDIA STUDIES (BERLIN STYLE)

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"[1]. 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 Studes) into a scientific method (Fernseh*wissenschaft*).

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"[2]. 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).

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.[3]

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

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[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 intermediary is Lewis Mumford, xxx

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

- a diagnosis developed 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 ("Ent/fernung") by radio and television

Heidegger's philosophy of technology is an epistemolgical 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).

McLuhan's impact (on occasion of the 50th anniversary of UM)

It is an indicator of discourse that the proper term "media" appeared in a non-technical book title only a time when the cultural impact of electronic mass media like radio and esp. television became so evident that the US Ford Foundation commissioned a study of this impact on education - resulting in McLuhan's book *Understanding Media*. Is is only that escalation of electronic media (as opposed to printing and film before) that the notion of "media studies" found its proper discoursive place. Electronic media are signal-based (as opposed to cinematography with rather still relates to the mechanical age and the Gutenberg galaxy, as identified by McLuhan); from there results an additional, not humanities-centered media theory: Shannon's mathematical theory of communication.[4]

I remember reading McLuhan in my student times for theory of history. At that time I could not know yet that a new discipline was soon to emerge at German universities called *Medienwissenschaft*, triggered by scholars like Friedrich Kittler, which retro-actively made McLuhan's *Understanding Media* the foundation of a discourse. By naming media in his book title in a

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[4]   On the genealogy of terms like "communication" and Communication Studies see John Durham Peters, Speaking into the Air. A History of the Idea of Communicaiton, Chicago / London (Univ. of Chicago Pr.) 1999

sense not restricted to the term medium in physics (air, liquids, gases), McLuhan made clear that cultural engineering had escalated into electronic agencies whose impact on society and economy had become so strong that it deserved an academic analysis of its own. By transforming what had initially been commissioned as a report on the educational impact of mass media, McLuhan has created a non-contentist understanding of media. Focussing not on the content of mass media (which is the realm of communication studies) but on their subliminal messages, he opened a non-hermeneutic definition of media-in-operation which resonates with the media-archaeological approach today. The title *Understanding Media* was untranslatable in its first German edition, it sounded too hermeneutic in German ears, but McLuhan's message has been unmistakingly non-hermeneutic. Mistaking "understanding" for sense-making itself would be a mis-understanding of media. Has McLuhan been a true media archaeologist *avant la lettre*? At one point, he compared his method with the one of archaeologists, but he never really took care in a close reading of the precise technological artefacts and their circuit diagrams. Media archaeology is "cold" in its non-hermeneutic gaze, but "hot" in focussing on technical details.

Let me return to my dialectic experience with *Understanding Media*. From studies in history I did not, in the course of my academic *curriculum vitae*, turn directly into a media historian, but having been trained by McLuhan's initial remark that the real impact of any technology is the change of pace that it introduces into human affairs, I was lead to focus on media tempor(e)alities that differ from the well-known "historical" ones. At that point, my reference to McLuhan's classic transcends it at the same time, across the historograpical border line which still limits *Understanding Media* - even if in his posthumous *Laws of Media* McLuhan experiments with a non-historical description of media time. McLuhan himself devoted chapter 15 to the impact of the mechanical, escapement-driven clock, linking it to typography and cinematograpic movement as opposed to the ephemeral fluidity of electricity. Electronic media which are the core of McLuhan's analysis are signal-based and incorporate a completely different chrono-poetics.

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

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.

Parallel to the emergence von "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 interdiscipinary "Helmholtz Zentrum für Kulturtechnik" at Humboldt University).

Anong the protagonists of such a "Kulturwissenschaft", Hartmut Böhme defined the discilinary matrix of "Kulturwissenschaft" which in a way claimed to include (or absorbe) "Medienwissenschaft", arguing for a "interdiszilinäre Kulturwissenschaft mit offenen Augen für die Geschichte der technischen Welt" <Böhme 1989: 30>.

[Wolfgang Frühwald re-phrased this with a significant shift of emphasis (which has become the *credo* of the GfM in the meantime): a "*kulturwissenschaftlich orientierte Medienwissenschaft*"[5].]

This perspective is critical. While cultural studies (including research on the technological impact) tend to reduce media to its discoursive 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 (Geertz' "thick description").

<see Adorno, *Current of Music*, vs. "Princeton Radio Research Project" by Lazarsfeld>

A specificity of Media Studies at Humboldt University is its privileged neighbourhood to Cultural Studies (Kulturwissenschaft) in its most literal sense: adjacent rooms (both in former Sophientraße and contemporary Georgenstraße location).

A special alliance with music studies: The Institute for Musicology and Media Studies

The special alliance between musicology and media archaeology[6]

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[5]   Wolfgang Frühwald, Geisteswissenschaften heute. Eine Denkschrift, Frankfurt/M. (Suhrkamp) 1991, 156

[6]   See Friedrich Kittlers monumental work on *Musik und Mathematik*, resulting in the volumes *Aphrodite* and *Eros* , Munich (Fink) 2006

leads to a special emphasis on the "sonic" (in alliance with the chair of popular music studies). Since 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.

II MEDIA ARCHAEOLOGY AS METHOD

Introducing Media archaeology

Media Archaeology is meant to indicates alternatives models of thinking the being of media in (emphatic) time, thus: an alternative to linear historiography of technology. No narratives of media origins in the historic sense, but rather the indication of another level of media tempor(e)alities: governing principles, archaic essentials – such as the *enduring* infrastucture of radio or the recursive return of the "alphabet" in the digital age which with its alphanumerical data processing all of the sudden recalls a genealogy of mathematics which had not been central to media studies in times of analog radio and television.

"Media archaeology" encompasses a variety of approaches to media. Media archaeology is

- a method of media analysis

- adressing the structural level of media practice (which Foucault named as the governing laws of media, such as Internet protocols or the von-Neumann-architecture of digital computers)

- an aesthetics: the "cold gaze" of distanced understanding but "close reading" of technological circuits

- an "archivology", that is: deeply obliged to archival evidence and historical as well as technological precision (circuit diagrams as source of evidence, f. e.)

- a nostalgia for the analogue (certainly, but this should be kept private)

- an art form (Paul de Marinis, Carsten Nicolai) which reveals the technical basics of media as opposed to the intangible hiddenness of micro-chip based media today ("reduced to the max")

- a form of generating knowledge with the media themselves as active agents / archaeologists (like digital signal processing which restored early "phonographic" records back to sound, speech and music again (*Lautarchiv* Berlin)

- a gesture of "open source" (de-constructing hardware): not in
the sense of public usage of source codes in programming, but in
the sense of dis-mantling media from their designed enframing, un-
clothing)

- an approach close to the materiality of media, here akin to
Classical Archaeology which deals with the material remains of a
culture (as opposed to philological hermeneutics)

- and finally the mathematical (square) "roots" (*arché*) in techno-
logos

But caution, let us not be seduced by the archaeological metaphor.
Media archaeology is n o t about beginnings, about origins in the
temporal sense, but rather about the *arché*, the laws governing
media in action. These principles are rather structural than
temporal; it only happens at its emergence a medium reveals its
structures before it becomes dissimulated by interfaces - like
early radio sets.

"The cold gaze" is a description of the media-archaeological
aesthetics indeed, somewhat close to Ernst Jünger's photographic
media aesthetics. Admittedly, German pre-war engineering culture
still lurks through (just like in Ernst Jünger's aesthetics of the
photographic "cold gaze"), and the Heideggerian ways of
fundamental re-thinking of terms like technology. Today, I would
add to the "the cold gaze" the unpassionate ears (listening to the
"sonic", that is: sound emerging from technomathematical media).

Media studies ask for a special mixture of technological
competence and epistemological reflection. One should indeed
expect for a researcher and critic of media to know exactly what
is the electro-magnetic induction or TCP/IP & 'Routing'.[7] But of
course academics do *not* read German media thoeries to learn
technological knowledge: "Was jene metaphysischen <?!> Schriften
sattdessen so anregend macht, ist die Selbstverständlichkeit, mit
der darin Medientheorie in Philosophie, Literatur und die
Geisteswissenschaften im Allgemeinen eingebettet sind" <ibid.>.

There is indeed a certain technologistic, that is: machine- and
code-centered school of media studies.[8] The field of (new) media

[7] Geert Lovink, Der Verbleib der deutschen Medientheorie", in:
same author, Zero comments. Elemente einer kritischen
Internetkultur, Bielefeld (transcript) 2008, 129-145 (xxx)
[8] As expressed in Wendy Hui Kyong Chun, Introduction. Did Someone
Say New Media?, in: New Media, Old Media. A History and Theory
Reader, eds. Wendy Hui Kyong Chun / Thomas Keenan, New York /
London (Routledge) 2006, 1-10 (4)

theory seems split between two very different approaches: "Media archaeologists, like Kittler, Wolfgang Ernst or Alexander Galloway describe the non-discursive practices of the techno-cultural archive. Media phenomenologists like Katherine Hayles, Tara McPherson or Mark B. N. Hansen analyze how phenomena in various media appear to the human cognitive apparatus, that is, to the mind and senses."[9] What is clear by this arbitrary name list already, is that the theoretical front is not one between continental European media archaeologists and media archivists on the one side and Anglo-speaking cultural critics of media practices on the other. The archaeological / archivological approach is rooted as much in Foucault's definitions[10] as it is connected with Marshall McLuhan's non-contentist media analysis. Whereas Hansen in his discussion of what is an "image" in the age of new (that is, electronic and digital) media, in an explicit Bergsonean tradition insists on the coming-into-being of the mediated image in the "enframing" acts of the human bodily cognition only[11], "posthuman cultural studies"[12] as radical media archaeology takes the point of view of the machine itself, with "radical" to be interpreted in two ways: going to the roots (which is the archive), to the beginnings (less in the sense of historic causality but temporal originality: the opening and generation of the time-critical *momentum*[13] and of temporal horizons), and in the sense of the mathematical (square root) as the constitutive force in algorithmic, techno-mathematical media.

This signal-based approach is different from the rather semiotic than approaches of Cultural Studies. There has been a translation barrier for relevant texts so far, different from the world of techno-mathematical engineering which would cross-culturally wire artefacts into standard operation. What looked like an antithetical configuration between German hardware-orientated and

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[9] Kjetil Jakobsen, in chapter 6 of his text "Anarchival Society", discusses "Archaeology versus phenomenology", in: Eivind Røssaak (ed.), The Archive in Motion. New Conceptions of the Archive in Contemporary Thought and New Media Practices, Oslo (Novus) 2010, 127-154 (141)

[10] The archive "governs the appearance of statements as unique events", whereas archaeology "questions the already-.said at the level of its existence <...> and the general archive system to which it belongs": Michel Foucault, The Archaeology of Knowledge, New York (Tavistock) 1972, 129 and 131

[11] Mark B. N. Hansen, New Philosophy of New Media, Cambridge, Mass. (MIT Press) 2004, 13. See Henri Bergson, Matter and Memory, New York (Zone Books) 1988, 35f

[12] Geoffrey Winthrop-Young, Cultural Studies and German Media Theory, in: Gary Hall / Clare Birchall (eds), New Cultural Studies, Edinburgh (Edinburgh University Press) 2006, 88-104 (100)

[13] See Axel Volmar (ed.), Zeitkritische Medien, Berlin (Kulturverlag Kadmos) 2009

and Anglo-American socially and culturally orientated media studies for a long time, nowadays seems "sublated" by a Hegelian trick ("List") of media-theoretical reason. So-called software studies[14] and a refreshed materialist (forensic) approach[15] links both cross-Atlantic schools.

Micro-technological research on signal transfer should not strictly be opposed to the media-phenomenological approach; the ways media affect human perception (in best McLuhanite tradition of analysis) is as close to neuroscience as it is to media archaeology.

Inbetween-positions exists as well, as expressed in Erkki Huhtamo's book *Illusions in Motion. A Media Archaeology of the Moving Panorama and Related Spectacles* - a kind of archaeology of *pre-cinéma*.

With no overall consensus about its definition, methods, tools, or even its field[16], there are different ways of doing media archaeology, much of them "re-mediating" new media (theories) with previous ones recursively.[17] At the same time a Foucault-driven media archaeology accentuates the discontinuities.

Media archaeology is aware of discontinuities in media cultures (as opposed to the reconciliating narratives of cultural history).

The German "school" that has emerged emphasizes material factors as prime movers of media history. From writing surfaces, and inscriptions on phonograph cylinders or celluloid film to machine architectures and computer code, "Kittlerian" media-archaeologists trace the widening gap between the technological evolution and traditional cultural engineering.

Let us take, as an example, the way media archaeology approaches a central artefact in occidental cultural engineering, the wheeled

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[14] See Matthew Fuller (ed.), Software Studies. A Lexicon, Cambridge, Mass. / London (MIT Press) 2008; Jussi Parikka, Digital Contagions. A Media Archaeology of Computer Viruses, New York et al. (Peter Lang) 2007

[15] See M. Kirschenbaum, Mechanisms. New Media and the Forensiv Imagination, Cambridge, MA (The MIT Press) 2008

[16] See Erkki Huhtamo and Jussi Parikka, An Archaeology of Media Archaeology, in: *Media Archaeology: Approaches, Applications and Implications*, eds. Huhtamo and Parikka, Berkeley / Los Angeles (University of California Press), 2011

[17] See Jay David Bolter / Richard Grusin, Remediation. Understanding New Media, Cambridge, Mass. / London 1999; I. Gitelman, Always Already New. Media, History, and the Data of Culture, Cambridge, MA (The MIT Press) 2006

clock, which in fact turns out to be a formative mechanism to develop the chronotechnical sense of oscillations which later became basic for the temporal agency of technical media.

[The editor of a forthcoming book on the interrlation between religion and technology sums up:

"Wolfgang Ernst <...> digs into the mechanisms of time-keeping, but arrives at quite different conclusions from those of Peters. Whereas Peters is concerned with the traces of ancient religious purposes embedded in the history of time-keeping technologies – traces that continue to have an effect in the present – for Ernst what is paramount to consider is the *dis*-continuity between the history of religious time-keeping and the evolution of time-based media. <...> for Ernst, the challenge facing the study of religion and technology is not to bring them closer together, but to rethink the terms on which they must remain separate, an argument he pursues through his account of the history of the oscillating clock and its progressive detachment from its original locus in the monasteries of medieval Europe."[18]

Or let us take the case of optical media : "One may still wonder who its real protagonists have been - the machines <..> or the people who created them, exhibited them, consumed them, and fantasized about them? The answer is an oxymoron: the *clue* of the story is their increasingly complex and contentious relationship. <...> Friedrich Kittler tells a very different story <...>.[19] Inventors do not figure as the primary agents, but their creations seem controlled by some external machinic logic rather than by human desires and needs. What Kittler (before his re/turn to ancient Greece) provocatively calls "so-called humans" rarely appear in his "media studies without people."[20]

Media archaeology argues against the presupposition of an primordial binding of media to the social and cultural spaces they occupy.

Huhtamo's "version of media archaeology is closer to Anglo-American cultural studies. It is based on the assumption that although one must understand hard technological facts, it may be even more important to grasp the discourses that envelop them and mold their meanings in unique cultural circumstances" <op. cit.>. But beyond the opposition between Cultural Studies and German Media Theory <Winthrop-Young 2006: 88>, a new generation on both sides interlaces (to use a term from electronic imaging) both

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[18]   Jeremy Stolow (ed.), Deus in Machina. Essays on Religion and Technology in Historical and Cross-Cultural Perspective, xxx
[19]   Friedrich Kittler, Optical Media: Berlin Lectures 1999, trans. Anthony Enns, Cambridge (Polity Press) 2010
[20]   John Durham Peters, "Introduction: Friedrich Kittler's Light Shows," in Kittler 2010: 5

approaches[21], leading to a kind of relegation between cultural and media epistemology which acknowledges both the non-human agencies (Bruno Latour) and their discursive dependencies.[22]

[For a case study in the dicourse-orientated approach to past medie see Carolyn Marvin, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (New York and Oxford: Oxford University Press, 1988)]

Where do technological continuities derive from? Just like Lev Manovich's "Archaeology of the Computer Screen" <xxx>,

Mark B. N. Hansen underlines in *New Philosophy of New Media*: no technological imperative leads from digitization to the rectangular screen (as human-computer interface HCI). Below cultural semantics (the iconology of images), "the digital image is an aggregate of quasi-autonomous, independently adressable, numerical fragments. It is not a frame and new media are not constrained by the rectangular frame. Cinematic interface may thus be seen as a cultural lag, rather than a technological imperative."[23]

But the matrix is a mathematical figure like the rectangular magntic core memory for storing an image in early digital computers.

Manovich in *The Language of New Media* <2001, 78f> interprets the possibilities of such interfaces as prefigured already by the cinematographic avant-gardes of the 1920s, in their experiments with jump cuts, animation and collage. According to Manovich, the avant-garde anticipated digital aesthetics.

But let us have a close look at a magnetic core memory. It is *not* just aesthetic strategies which became embedded in the commands and interface metaphors of computer software. The modernist strategy of collage reemerged as a 'cut and paste' command, the most basic operation one can perform on digital data."[24]

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[21] See the introduction of the editors in: Hall / Birchall (eds) 2006, 1-28, and Caroline Bassett, Cultural Studies and New Media, in: ibid., 220-237

[22] As an exemplary study from the German side see Cornelius Borck, Hinrströme. Eine Kulturgeschichte der Elektroenzephalographie, Göttingen (Wallstein) 2005; same author: Electricity as a medium of psychic life. Electrotechnical adventures into psychodiagnosis in Weimar Germany, in: Science in Context vol. 14 (2001), 565-590

[23] Kjetel Jakobsen, Anarchival Society, in: Eivind Rossaak (ed.), The Archive in Motion, Oslo (Novus) 2010, xxx

[24] Lev Manovich, WHAT IS DIGITAL CINEMA? = http://www.manovich.net/TEXT/digital-cinema.html (Abruf Januar 2011). Siehe auch ders., Engineering Vision: from Constructivism to the Computer (The University of Texas Press), forthcoming

But the so-called "post-cinematic image" is different from the cuts and jumps and interactivity in computer games.[25]

The language of so-called new media[26] (which obviously refers to digital media driven by the binary code) is not just what interfaces offer to the human user, it is as well machine language on the operative level of computer programming.

Such a perspective, without saying, is less discourse-orientated than the "social media" approach.

How could we otherwise explain that television broadcasting as a mass medium emerged after Second World War both in Western and in Eastern Block countries on the same, almost identical technological basis (both derived from pre-war developments)? Why was there not something like a specific "socialist" (even "Marxist") technological variance? The articulation of ideological differences was rather reduced to the content of the television programs.

For many years there has been a translation barrier for relevant German or French (Simondon) techno-philosophical texts to reach the anglophonic world so far - different from the world of techno-mathematical engineering which cross-culturally wires artefacts into standard operations almost immediately.

Let us start to translate in all senses now.

What looked like an antithetical configuration in German hardware-orientated and and Anglo-American socially and culturally orientated media studies for a long time, nowadays seems "sublated" by a Hegelian trick ("List") of media-theoretical reason. So-called software studies[27] and a refreshed materialist (forensic) approach[28] links both cross-Atlantic schools.

Further definitions of media archaeology

Media archaeology is both a research method in media studies, and

[25] See xxx, in: Benjamin Bigl / Sebastian Stoppe (Hg.), Playing with Virtuality. Theories and Methods of Computer Game Studies,Frankfurt/M. (Peter Lang 2013, xxx-xxx
[26] Lev Manovich, The Language of New Media, Cambridge, Mass. (The MIT Press) 2001
[27] See Matthew Fuller (Hg.), Software Studies. A Lexicon, Cambridge, Mass. / London (MIT Press) 2008; Jussi Parikka, Digital Contagions. A Media Archaeology of Computer Viruses, New York et al. (Peter Lang) 2007
[28] See M. Kirschenbaum, Mechanisms. New Media and the Forensiv Imagination, Cambridge, MA (The MIT Press) 2008

an aesthetics in media arts. It denominates the non-human procedures which happen in media 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[29], 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)."[30]

Media archaeology is the complementary method to media phenonemology. It does not look at media on the level of their surface effect on humans (interfaces), but rather uncovers the hidden agenda of technomathematical artefacts, or better: artefactuality, focussing on temporal and time-critical configurations.[31] Whereby to most human users media are opaque technology - "present-at-hand" (*vorhanden*) in Heidegger's vocabulary -, media archaeology tries to make technology transparent for analysis, that is: "ready-to-hand" (*zuhanden*). The intellectural father of Humboldt University, Wilhelm von Humboldt already differentiated between the "external form" and the "inner form" of language, neologistically conforming with phenotype and genotype and the figure / ground dichotomy as re-discovered media-theoretically by Marshall McLuhan from *Gestalttheorie*.[32]

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[29] Claude E. Shannon, The Mathematical Theory of Communication, in: Bell System Technical Journal 27, Juli/Oktober 1948, 379-423 / 623-656

[30] 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

[31] "Nicht <...> eine ableitende Begrndung, sondern <...> aufweisende Grund-Freilegung": Martin Heidegger, Sein und Zeit, 15. Aufl. Tbingen (Niemeyer) 1979, 8

[32] See Marshall McLuhan / Bruce Powers, The Global Village, xxx,

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Media archaeology at first sight is about technological architectures, but it is concerned with media not only on their structural but as well on their *operative* level, thus becoming "post-structural" or "diagrammatic", corresponding with the generative techological diagram between gesture and symbol.[33] This post-structural vector (a diagrammatic media theory) places it beyond semiotics and closer to the analysis of signal processing (a signal being the physical representation of a message respectively information *in time* - that is, with time as the variable of functions under analysis).

Technological media themselves have an infolded, implicit knowledge of the physical and mathematical world which differs from human perception. Media archaeology as a doube-faced method here takes the point of view of humans and hypothetically the point of view of media as well. To exemplify it: The length of numbers in binary notation which is at least double that of numbers in the decimal system "makes the binary system impractical for human calculators, but it does not upset computers in the least. From the computer's point of view, these sequences of 1 and 0 are convenient, for they are easily codified in electric signals; the passage of current expresses 1, its interruption 0"[34]

- which pefectly correspondes with a binary switch in the real world of electronic which was available "at hand" in times of the mathematician and engineer Claude Shannon: the electromagnetic relay.

What startet with the electro-mechanical relay resultet in electronic flip-flop circuits first on vacuum tube, then an transistor basis. Different from e. g. *ternary* switching

"It is much easier to work in the scale of two than any other, becuase it is easy to produce mechanisms which have two positions of stability; the two positions may then be regarded as representing 0 and 1."[35]

referring to Edgar Rubin and Max Wertheimer. See Edgar Rubin, Visuell wahrgenommene Figuren. Studien in psychologischer Analyse, London (Gyldendalske Boghandel) 1922. For an application see Richard Zakia, Perception, Evidence, Truth and Seeing, in: The Concise Focal Encyclopaedia of Photography, Elsevier (Focal Press) 2008, 239-250 (242)

[33] Guerino Mazzola, La Vérité du Beau dans la Musique, Paris (Delatour France) 2007, 153 (explicitely referring to Jean Cavaillès, Gilles Deleuze, Gilles Châtelet and Charles Alunni)

[34] Denis Guedj, Numbers. The Universal Language, xxx (Thames & Hudson) xxx, 59

[35] Alan Turing, Lecture to the Mathematical Society on 20 February

Media are not just objects of media-archaeological analysis, but as well active "archaeologists" of a different kind of knowledge themselves (understood here in Bruno Latour's sense of "non-human agencies).

Let us write and read carefully: media *archéology*. In ancient Greek, *arché* splits into a temporal and a functional meaning: *origin* on the one hand, and *command* on the other.[36] Misunderstandings should be avoided here. Instead of "media archaeology", should I not rather write "prehistory of media"? The term *prehistory* implies a certain teleology that is alien to technology.[37] The prefix "pre-", though, does not just refer to a "before" in its temporal, historically lineare sense, but rather to a structural pre-condition as well. This pre-structuring "before" can happen in non-linear modes (as described in René Thom's theory of catastrophy) just as there are electro-dynamic processes which are ultra-sensitive to slightest changes which result in a complete re-organization of the whole system. Theories of history fail when they have to explain non-linear, contingent events in the past[38], such as the sudden break into the Berlin wall on 9th November 1989 when the answer "immediately" ("sofort") by Schabowski corresponded with the immediacy of live transmission in radio and TV.

Such a cintingency can not be formulated in terms of historical discourse at all, but this does not lead to agnosticism. Instead, a modelling of mathematical probabilities is the dynamic answer to that question.

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 ("Ö") which is the symbolic expression of the verbal notion of *arché*). The Deleuzean equivalent is the bio-systematic trope of *rhizome*.

1947; printed in Vol. 10 in the Charles Babbage Institute Reprint Series for the History of Computing, A. M. Turing's ACE Report of 1946 and Other Papers, The Massachusetts Institute of Technology, 1986, 106-124 (114)

[36] See Jacques Derrida, Archive Fever, xxx, Introduction

[37] David A. Mindell, Between Human and Machine. Feedback, Control, and Computing before Cybernetics, Baltimore / London (Johns Hopkins University Press) 2004, 6

[38] Ludolf Herbst, Komplexit舩 und Chaos. Grundzge einer Theorie der Geschichte, Mnchen (C. H. Beck) 2004, 213

Media archaeology refers to the past insofar as it adresses the condition of the possibility for current media operations, which means: being (still) at work. The temporal category "past" thus appears rather like a temporal function of a present process, as an unfolding of presence-in-action, in the mathematical sense of Fourier analysis and Markov chains.

Media archaeology is not a simplification, but an analytical reduction to techno-logical essentials and *principles* (the Latin equivalent to *arché*); when Hermann Helmholtz published his seminal *Lehre von den Tonempfindungen* in 1863, the subtitle declares a kind of sonic archeology: the "physiologische Grundlage", that is almost literally: *arché* (foundation), for the theory of music. In this sense Milton S. Kiver's book *Television simplified* (New York 1946) does not teach the appropriate use and consuming of TV programs but the precise description of its inherent electrotechnology.

Media archaeology (in my understanding) aims at an *archaic* media experience. The archaic, besides its temporal meaning ("origins"), refers to a structural element, to the dominant (*arché*), essential features of a medium system. At the same time, aesthetically it means its reduction to the essential, the elementary bits, a "rarification" of discourse iin Foucault's sense.

According to the media-archaeological *credo*, technological structures become especially evident in beginnings: "It is the beginnings of invented things, which appeal to me", writes Lance Sieveking (who wrote one of the first televisoin dramas transmitted by the BBC), and explains: "For it is a their beginnings, that we may detect their true nature", that is: their epistemological essentials. Sieveking is quoted here as the *motto* of the Memoirs of John Logie Baird[39] which is a very archaeological insight into first steps of the electro-mechanical television apparatus itself. "In principle, the *televisor* is both simple and ingeniour", comments the brochure accompanying the model kit *The Televisor*, developed as teaching device by the Middlesex University.[40]

Media themselves as archaeologists (archaic video recording)

At the beginning of Donald McLean's *Restoring Baird's Image* (literally) was the misunderstanding of grammophone records in the

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[39] *Television and Me. The Memoirs of John Logie Baird,* edited by Malcolm Baird, Edinburgh (mercatpress) 2004

[40] See www.mutr.co.uk

archives of the BBC: no musical sound; attached to oscilloscope: figurative shapes appeared and suggested line-by-line television; this recalls Bill Viola's definition of the electronic image as the "sound of one-line-scanning", close to the phonographic records.

The sonification of the electronic image in fact served as a media-archaeological tool. Baird reports about his experiments to enhance the luminisity of his early television images:

"In testing out the amplifiers I used to use headphones and listened to the noise of the vision signal made. I became very expert in this and could even tell roughly what was being televised by the sound it made. I knew, for exampke, whether is was the dummy's head or a human face. I could tell when the person moved, I could dinstinguish a hand from a pair of scissors of a matchbox, and even when two or three peole had different appearances I could even tell one from the other by the sound of their faces. I got a gramophone record made of these sounds and found that by laying htis with an electrial pic-up, and feeding the signal back to a television receiver I could reproduce the original scne. <...> If the cinema had never been invented the 'Phonovisor', as I christened the device, might habe been / worth developing; it was certainly an intriguing process. Vision into spound and sound back into vision[41]

- a spatio-temporal hybridisation of ancient "ut pictura poiesis" aesthetics and of Lessing's *Laokoon* theorem.

But only by the inter-mediary application of specially written filter software, i. e.: digital processing of the damaged signals, could these original grammophonical recordings be "restored" (or rather reconstructed?). It is not the original recording we re-play, but an re-enactment.

McLean describes the metamorphosis of signals into information: "The stream of numbers is created into a list of values that are stored in the computer as a data file holding the raw, unprocesse data. The signal is now digital and is the starting point for digital signal and image processing" <ebd.>. "Line by line, the correction values plot out the profile of errors in the signal's timing" <McLean 2000: 93>.

In such a moment media archaeology is not just a method of human media studies any mor, but technical media themselves become the agency of (digital) media reconnaissance. Thus, the computer itself becomes an archaeologist of media eventality.

"If it were not for computer technology, Baird's *grammophone videodiscs* would continue to be curiosities that merely hinted of

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[41] Television and Me. The Memoirs of John Logie Baird, hrsg. v. Malcolm Baird, Edinburgh (mercatpress) 2004, 64f

a time before television as we know it. Their latent images would remain unseen and the information imbedded in them would still be compeltely unknown." <McLean 2000>

McLean resists the classical archaeology metaphor: "Unlike traditional archaeology, the artefacts are not embedded in layers of history but have existed in both private and public collections, largely ignored as curiosities" <McLean 2000: xvi>; media time is time of latency. Therefore, Baird's *Phonovision* is not "dead medium" (in Bruce Sterling's sense), but an aggregation, wainting to be re-processed in order to become a true medium (in operation) again - an existential temporal form which, in this case, coincides with the technological act of induction itself.[42]

What kind of "archaeology"? Media materialism

<copy / Modifikationen § MEDARCHCAM2>
Positioned between archeology as academic discipline of analyzing material culture and the Foucauldean notion of the "archive" as the set of rules governing the range of what can be verbally or audiovisually expressed at all, media archeology is first of all a methodic way and aesthetics of practicing media studies and media criticism. But besides, it is a hunting for "dead media" discoveries and reverse engineering (such as Semen Karsakof's 1832 design for an "intellectual machine"[43]). Finally, media archaeology describes moments when media themselves, not exclusively humans any more, become "archeologists" of epistemic objects, like practiced in so-called "content-based" image and sound retrieval in media-archival data banks. Somewhat beyond Marshall McLuhan, media are not just extensions of men any more but have become autonomous here.

Let us capture the difference between media archaeology and classical archaeology. While sharing with the classical archaeologicst the attention of the material artefact ("hardware"), the essence of media archaeology comprises the *operative*, processual mode of technological media as well.[44]

Let us define media archeologically, while at the same time resisting the epistemological temptations of a metaphorical use of that term, trying to differentiate between technical media proper

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[42] For an online re-presencing of the moving image sequence see http://www.tvdawn.com/earliest-tv/the-silvatone-recording-1933 (accessed November 2013)

[43] See Wladimir Velminski / W. E., Semn Karsakov: Ideenmaschine. Von der Homöopathie zum Computer, Berlin (Kulturverlag Kadmos) 2007

[44] At this point, we should pay respect to the so-called "Processual Archaeology" as developed by the Cambridge school.

and cultural technologies (such as religious rituals and liturgies) in a broader sense.

Archaeology, in Michel Foucault's notorious definition,

"designates the general theme of a description that questions the already-said at the level of its existence: the enunciative function that operates within it, the discursive formation, and the general archive system to which it belongs."[45]

[Archaeology in its traditional sense is "indicating the material or substance of which anything is made or consists" (Oxford English Dictionary). For Foucault, archaeology is aware rather of the enunciative level of what happens; an enunciation is what is *not* immediately visible, rather geno- than phenotextual.[46] It is not a relation between surface and deep ground, but rather a Moebius-loop-like dynamics of back and forth.]

When we apply this Foucauldean term to the genealogy of media, thus performing a *media archaeology*, his somewhat vague notion of the "discursive formation" suddenly can be addressed in positive and presice technomathematical terms. Media archaeology performs a technological micro-epistemology, that is: disovering, analysing and describing the epistemological sparks which spring from the most concrete level of technology itself, such as the delicate circuitry of the electronic saw-tooth signal generator which creates the jumps of single cathode ray lines within a television set in order to achive the impression of a cohrent image for (lagged) human perception at all.[47]

[What predominantly counts in information processing media is not its material support; therefore no more archaeology in the classical sense is required but rather cybernetic archaeo*logistics*.]

While multi-media aesthetics is a surface effect, digital signal processing is its media-archaeological generative law. Let us not forget the techno-mathematical essence of computing, its electric fluidity and switching circuits.

[Such is the media *archive* in Foucault's sense (who uses this word in French in the singular mode, not to be confused with the classical state archive which in French is *plurale tantum*, notably *archives*). As opposed to structural laws, the media-archaeological *archive* is dynamic: all the difference between an algorithm as a symbolical mathematical notation and its implementation as running

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45   Michel Foucault, The Archaeology of Knowledge, xxx
46   See Walter Falk, Vom Strukturalismus zum Potentialismus. Ein Versuch zur Geschichts- und Literaturtheorie, Freiburg i. Br. / Mnchen (Alber) 1976, 310f
47   See A. J. Klopow, Grundlagen der Fernsehtechnik, bers. und ergänzt v. P. Neidhardt, mit e. Geleitwort von Manfred v. Ardenne, Berlin (VEB Verlag Technik) 1956, chapter 5 (50-99)

program in real hardware.]

What is the relation between the phenomenological surface of media and their concealed technological condition? Whatever appears on the computer screen is a direct expression of its algorithms and codes (though disguised under audiovisual metamorphosis). It is the emphasis on *semiosis* which differentiates Charles Sanders Pierce's semiotics from straightforward structural linguistic semiotics, that is: the processual relation between signifier, signified and the "interpretant". We can catch this on the tactile level of computer interfaces: Whenever we press an alphanumeric symbol on the keyboard as part of a string (a word, a sentence, a text, a formula, a graphic notation), the "sign" (the single letter) transforms into a electro-physical signal.[48] A transformation (or even "transsubstantiation" in the theological sense) takes place. When this passage of symbol into signal takes place, it looses all its semantical referentiality and becomes a coded element within a (physically) real word - loosing "meaning" while gaining "indexicality".

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" <TS Chun, 12>,

writes Wendy Chun in the introduction to *Old Media, New Media* <?>, 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" <Chun ibid.>.

To apply this argument to audio media, especially to short wave AM radio, the apparant dichotomy turns out to be rather interlaced. When I listen 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

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[48] As emphasiced in: http://www.agis.informatik.uni-bremen.de/ARCHIV/Publikationen/BegegnungenImZeichen.pdf

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 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.

Allow me a remark on occasion of the current PRISM debate: Necessity for "Time-Critical Media Studies" in both senses of "time-critical": in the sense of political analysis and in the most presice "forensic" (Matthew Kirschenbaum) hard- and software sense = the media-archaeological level of analysis. Obviously, PRISM refers to the fiber glass cable which links Contintental 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.

Micro-research

In media-archaeological terms, this requires micro-research.

"Open hardware" can be read literally: revealing the hidden structures in hardware, thus undermining the *dissimulatio artis* which is the central trope of techno-rhetorics for media in order to be successful towards humans. In May 2009 the *Micro Research* lab in Berlin[49] offered a workshop on the "Epistemology of electromagnetic waves" (curated by Shintaro Miyazaki); other workshops comprised subjects like the RFID sniffer workshop which led to the practical construction of a simple analog electronic circuit which detects the presence of 13.56 MHz RFID tags which are commonly used in plastic cards in libraries or shops.[50]

[Let us remember: media-archaeology is about the fundamental, the essential, the ascetic, the reductive.]

In this way, media archaeology is an active examination and questioning of technolgy - "digital forensics" (Kirschenbaum).

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[49] *Micro-research* is the name for an independent research centre in Berlin focussing on the analysis and construction of "open hardware" on the one hand and free software on the other.
[50] See: http://shop.marcboon.com/snifferkit.pdf

Circuit bending

A related media-archaeological method in media arts is "circuit beding", a creative short-circuiting of (low-currency) electronic devices in (rhetorically expressed) "catachretic" ways, very often used in the acoustic field to create new kinds of sound by means of a "jumper" cabel which connects two points in the circuit in a way not intended by the engineers.[51] Unearthing previously un-discovered sounds in electronic devices is a media archaeology of the implicit acoustic knowledge of an electronic medium. In a way, Lev Thermin did this when mis-using radio technology to create his T*heremin-vox* which is circuit-bending by interference of the body (hand gestures) into an electro-magnetically oscillating field.

Soft media archaeology

The term "media archaeology" is *en vogue* nowadays in media studies; we refer to the writings and projects of Siegfried Zielinski, Timothy Druckrey, Erkki Huhtamo and others. Especially Bruce Sterling's "Dead Media Handbook Project" (initiated 1995, conceived for the Internet) cares for the redemption of otherwise forgotten technologies. Zielinski 1996: "[...] media archaeology [...] in a pragmatic perspective means to dig out secret paths in history."[52] A lot of these authors take the term "media archaeology" at face value, almost metaphorically: referring to the "digging out" of forgotten machinic visions of the past, of antique or baroque media design which was never materialized, which has remained a singular effort and which are simply forgotten today.

With the *Telharmonium Press* in Hollywood, California, Garnet Hertz published a book in the spirit of Sterling's *The Dead Media Handbook*, entitled itself in an "antiquarian" fashion of an 18th century book-title: *A Collection of many Problems Extracted out of the Ancient and Modern Philosphers: As, Secrets and Experiments in Informatics, Geometry*, Cosmography, Horologiography, Astronomy, Navigation, Musick, Opticks, Architecture, Statick, Mechanicks, Chymistry, Water-Work, Fire-Works, etc., Wherennto is added, Dead Media (2009).

If we single out by chance (that is: by random access) any of these items, we find e. g. the switch-board of an early computer installation in an office. The book is supplemented by scraps of

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[51] See, e. g., http://absurdity.biz, and the compilation CD *Noise and Toys* vol. 1 (2006)

[52] Originally published:7/11/1996, at: www.ctheory.net

indented paper stripes which apparently is Morse code. What is declared as "dead media" here, in this case can principally be re-enenacted (thus: deciphered, read, sonified). That is the difference to ancient sculptures or other traditional archaeological artefacts. Melancholy is the expression of nostalgia for something we long for but can not reach any more, since it is irreversibly gone. The media-archaeological approach is non-melancholic though, since past media are not dead, but un-dead, principally to be re-activated and thus in a radically present state of latency. Such media-archaeological artefacts are embedded in another temporal logic which defies historical discourse: They remain in latency just like a voice recorded on magnetic tape; at any moment, though, they can be re-activated, signals as a function of time:

"___ --- ___"

Media archaeology is not a specific form of media history but rather an alternative to the historical discourse itself, just like Fourier Analysis replaces the linear time axis of sinusioidal signals by frequencies.[53]

[Different from history and narrative]

Referring to the past, digitization of archives from the past affects paper-based texts (new options of accessablity by intelligent search algorithms), but as well images and sound. Here, archives themselves - the traditional data-base for historical research – become temporalized: streaming archives. The micro-temporality in the operativity of data processing (synchronization) replaces the traditional macro-time of the "historical" archive (governed by emphatic historical consciousness) - a literal "quantization". Our relation not only to the past but to the present thus becomes truly "archival". Let us practice an alternative form of minimal, serial time-writing (or rather registerin), close to the paradigm of computing. Computers practically transform narrative aesthetics into non-discursive, algorithmic configuration of events. We have to face the operativity in digital culture beyond historical nostalgia for narrative.

Media archaeology's affinity to mathematics

[Mathematically expressed, the *arché* here is a vector which conceptually "combines the idea of magnitude (a core element of

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[53] See Friedrich Kittler, Draculas Verm 臘 htnis. Technische Schriften, Leipzig 1993, 200

mathematics) with that of direction (a core element of physics)"[54].
Calculating vectors is an alternative way of expressing what is
commonly known as the "evolution" of media.]

Media, when taken as physical channels of communication and as
technical artefacts which are operated by symbolic codes and
streaming data, require to be analyzed in ways different from
texts or works of art. The media archeological theory is such a
way of looking at media objects: enumerative rather than
narrative, descriptive rather than discursive, infra-structural
rather than sociological, taking algorithms (literally) "into
account".

The natural way of rendering Foucault's passages on archaeology
intelligible (like Foucault's affinity to serial music, notably
Barraqué's) is to take the notion of enunciative function at its
mathematical face value.[55] This is the context when Kittler as well
poses an explicitely archaeological question.[56]

A pixel is the smallest conceivable picture element, which makes
sense in a semantic way only when appearing within a group.

Once more: Media archaeology is not Mass-Media studies; its notion
of communication rather relates to Claude Shannon?s "Mathematical
Theory of Communication" which does not mistake communication for
mutual human understanding. Let us thus say: *mediamatics*. The
"digital" means the countable; media archaeology is a radically
mathematical mode.

When humans calculate in their mind and are assisted by paper,
eraserhead and pencil, Alan Turing wirtes in his seminal paper of
1936 "On Computable Numbers", they are in a non-human, rather
machinic mathematical state.

"Images" from data

To go further with Foucault: There is an analogy between the

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54   Denis Guedj, Numbers. The Universal Language, xxx (Thames & Hudson) xxx, 97f
55   Martin Kusch, Discursive formations and possible worlds. A
     reconstruction of Foucault's archeology, in: Science Studies
     1/1989, 17-25 (17)
56   "Das wäre meine archäologische und diskursgeschichtliche Frage:
     woher kommt dieses wundersame System der modernen Mathematik mit
     ihren reelen Zahlen? <...> es ist singulär in der Geschichte der
     Menschheit, da° eine Kultur berhaupt versucht hat, mit reellen
     Zahlen die Welt zu berechnen und zu beherrschen." Friedrich A.
     Kittler, Die Maschinen und die Schuld, im Interview durch
     Gerburg Treusch-Dieter in: Freitag No. 52/1, 24. December 1993

(media) archaeological and the medical gaze.[57] With the surgical
gaze becoming more and more dependent on imaging technologies,
both perspectives converge literally.[58]

Media archaeology is close to mathematics. Michel Foucault took
enunciative logics instead of (like Hegel) cultural history as the
foundation of his archaeology of spirit. Thus a notion of
Archeology of Knowledge comes into play which does not want to be
understood metaphorically or philosophically, but strictly
mathematically: as the study of enunciative functions.[59]

So what is *digital* art? An artform just using digital media, or a
mathematical artform in itself? Media archaeological art treats
images not iconologically, but with the "cold gaze": as lot of
functions, thus calculable (rather than narratable). Just as in
Dziga Vertov's film *The Man with the Camera*, cinematography is not
for human eyes only, but Kino-Glaz.

Once digitized, images can be algorithmically calculated and
intrinsically navigated. After all, why should we always try to
force the semantic criteria of human image understanding upon the
computer? On the contrary, the entirely different criteria of
image similarity in computing may leed to unexpected insights in
visual culture. Beyond meta-dating, we no longer force a foreign
medium (texts) upon images, but approach them in their own
mediality. Literally "on the other side", media archaeolgy deals
with time-critical psycho-physical perception as well.

Some human perceptual processes "operate upon data on the screen
in a direct, bottom-up manner by examining the data in very brief
periods of time (utilizing little or no associated memory) and
organizing it automatically into such features as edge, color,
depth, motion, aural pitch <...>."[60] Such bottom-up perception is
media-archeological *aisthesis* indeed.

Media archaeology is akin to the gaze of the optical scanner. Such
as the electronic tunnel microsope does not actually transfer
images of the atomic surface of matter, but analyses its object by
matching data statistically and reprsenting these calculations as
images - just like bats don?t perceive space iconically, but by
echo orientation in space[61] - culture-free images.

The significant deciphering of images is not a priviledge of
animals alone any more. There are now options for search enginges:
visual search with precise targeting, down to each pixel in an

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[57]   See Michel Foucault, Birth of the Clinic, xxx

[58]   See Markus Buschhaus, ?ber den K[?]per im Bilde sein. Eine Medienarch 與 logie anatomischen Wissens, Bielefeld
       (Transkript) 2005, 171

[59]   Michel Foucault, Archeology of Knowledge, 1969/1974: 106

[60]   Edward Branigan, Narrative comprehension and film, London / New York (Routledge) 1992, 37

[61]   See E. Gal, Geschichten vom Finden, in: Schattenlinien Nr. 4/5, 2. Jg., Heft 2 & 3 (1991), 3-35 (6)

image. Such monitoring systems perform a different panoptical regime: they do not concentrate on iconology, but on data patterns and clustering. David Gordon's video art installation *24 hours Psycho* media-archaeologically undermines the story by slowing it down, just as Angela Bulloch's "Pixel Works", dissolving a cinematographic frame, after digital sampling, into discreet macro-pixels.

An image, for media archaeologists, is different from what an image is to art historians or Visual Studies. The media archaeological gaze is close to radar which is rather a "system of measurement rather than communication"[62]. Radar is an analogue technique rendering a physical image (rather map) of the surrounding area of an antenna, while on the level of signal transfer it operates with discreet impulse- and duplex technology. Thus the radar image is rather analytical (a measuring device) than a medium of representation or projection. Both though, TV and radar, are based on the same cathode ray tube; the German TV set which was ready to go into mass production in 1939 was immediately converted to military uses after the outbreak of World War II.

III MEDIA TEMPORALITIES AS OBJECT OF KNOWLEDGE (AND THEIR SONIC UNDERSTANDING)

[In favor of an epistemological undertanding of technical media]

Starting from an *operative* definition of technological media, media epistemology can be specified in its various modes. Against G. W. F. Hegel's critique of mathematical machines and his philosophy of history a close reading of the specific tempor(e)alities of technologies opens alternatives. Media diagrammatics here replaces traditional history of technology. Technological and epistemological experimenting (with) media time leads to a final focus on *sonicity* as epistemic media object in the dynamic chronosphere.

There is a specific quality of *media* epistemology: Its analysis is firmly rooted within techno-mathematical, that is: material and logical constellations from which inductive sparks of epistemic questions and insights are being derived.

Let us first of all assume as the basic definition of "what is a medium?" that technologies are only in beeing once they *operate* (processing signals and / or symbols). Media epistemology is thus always rooted in and limited by technological actuality, different

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[62]   Woodward (1950), as quoted in: US Signal Corps (1957), here quoted after: Friedrich Wilhelm Hagemeyer, Die Entstehung von Informationskonzepten in der Nachrichtentechnik. Eine Fallstudie zur Theoriebildung in der Technik in industrie- und Kriegsforschung, Diss. Berlin (Freie Universit 舩, FB Philosophie u. Sozialwissenschaften) 19xx, 341

from speculations in theoretical physics or purely cognitive philosophy. The case is different for the most powerful contemporary medium: the digital computer.

[Feeling "at home" in Hegel's former house]

Humboldt University Media Theory finds itself suitable at home in its present location which has been formerly Hegel's house.

Contrary to Gottfried Wilhelm Leibniz' vision of a universal language expressed in mathematical symbols (a *caracteristica universalis*), Hegel rejected the option of mechanized reasoning.

Charles Babbage in fact declared himself a "philospher" as well. Should we say "logotec" instead of "technology"?

Operative media diagrammatics

Different from Hegel's *Logik* is Charles Sanders Peirce's first "electrification" of logical operations (as machine) by drawing the first electric circuit. Media archaeological analysis is operative epistemology in the sense of Peirce's "diagrammatic reasoning".

New philosophy of media time(s) - or disguised Hegelianism?

Re-discovering Hegel for media theory leads as well to a critical re-consideration of Hegel's philosophy of history. Is it possible to interrelate different layers of technology in recursive ways rather than implying linear development as non-historicist concept of technological tempor(e)alities?

The specific (a)historicity of media time (epistemology of the technological object)

By analyzing and experimenting with technical media, their specific temporality and especially time-critical, micro-temporal processes can be experienced. Media-experimental settings perform "culturalized" knowledge of a secondary nature - with measuring media being the crucial oberserver. A technological setting is an artificial configuration based on cultural knowledge - but still it is of scientific nature, since there are electro-physical laws at work which are not completely dependend on the arbitrary

cultural discourse. The media-experimental event can not be
reduced to discoursive effects. There is always an imminent
physical or mathematical "veto"

- which is timing in terms of recursive algorithms, generating
presence.

From time-based media to media tempor(e)alities

No cybernetic analysis of technology, whether it be analogue or
digital, is complete "unless we possess a proper analysis of its
appropriate time-concept"[63]. Any media event is a time-based
function of signals.[64] Analogous to the way Martin Heidegger once
re-shaped the philosophical question from "what is time" to "how
is time" (the *shape of time* as expressed by George Kubler) as a
processual existence ("eventuality"), media archaeology replaces
the ontological definition of media by a dynamic one: media-in-
beeing (in allusion to the British military term of a "fleet in
beeing"), its temporal mode of existence. Processuality is the
core definition of electro-mechanic and electronic media as such.
Time-based media in the traditional sense comprise literature and
theatre, then grammophone and film. Media archaeology sharpens
this notion by focussing on *time-critical* processes as well, i. e.
such media, where micro-temporal events are crucial for the
overall process to happen at all (synchronization of
telecommunication, clocking in computers).

The difference between "time-based" and "time-critical" is itself
decisive. "Critical" is meant in the ancient Greek sense – that
is, "decisive". In time-critical processes, a whole plethora of
temporal figurations are at work, not just the temporal axis as an
abstract parameter. Time itself becomes figurative here, a kind of
chrono-actor.

The term "media archaeology" sounds like a structural analysis,
but – opposed to the archaeological metaphor of "layers" – it is
concerned with what is at the essene of technological media: their
operative, processual, that is: temporalized mode of existence.
Only when being in operation a medium is truly in the medium
state; otherwise the apparatus is a piece of furniture.

Let me come to the heart of "digital", that is: computer-based

[63] Norbert Wiener, Time, Communication, and the Nervous System,
   in: Annals of the New York Academy of Sciences, Bd. 50, 1948/50,
   197-219 (197)
[64] Karl Küpfmüller, Die Systemtheorie der elektrischen
   Nachrichtenbertragung, Stuttgart (Hirzel) 1974, 393

culture. In 1936 the "invention" of the computer as symbolical
machine happened as a by-product of Alan Turing's answer to the
problem of the mathematically undecidable: "Computable" numbers
are those which are calculabe by *finite procedures*. The question
if computer programs have a sense of ending (the *Halteproblem*)
leads to the more general consideration of media-induced
temporality. Media systems internally develop new forms and
operatations of temporal sequences and a different notion of
"ending" (recursive functions, real-time operations) and provide
of a micro-dramaturgy of synchronizations where smallest bits of
time are "critical" for the success of the whole media event.

[Externally media are able to address the human perception on its
most essential channel of being-in-time (both on the level of
neurons and in consciousness). Thus Heidegger's philosophy of *Sein
und Zeit* needs to be extended and specified to the question of
media tempor(e)alities.]

Focus: Media tempor(e)alities

Michel Foucault's archaeology of knowledge remains somewhat
letter-centred and thus autopoietically refers to the alphabet-
based world and the symbolic order of textual libraries. But
"discourse analysis cannot be applied to sound archives or towers
of film rolls."[65] With the age of so-called analog media such as
the phonograph and cinematography, signs as a function *of* and *in*
time themselves can be registered. They maintain not just a
symbolical relationship to macro- and microtime (such as
historiography), but they inscribe and reproduce functions of time
themselves. It is only with the digital computer that the symbolic
regime *dia*lectically re-turns: this time in a genuinely dynamic
mode (which differentiates implementation of software from the
traditional Gutenberg galaxy): algorithmic time, operative
diagrams.

What is frequently called "posthumanistic" by now, is very much
bound to a critique of historiographical narrative. Thinking based
on digital codes directs itself against "'progressive' ideologies,
to replace them with structual, system-based, cybernetic moments
of thought <...>".[66] This almost Foucauldean discontinuity is what
currenty is associated with the rupture between the anlogue and
the digital. Post-modern critique of narrative in historical
discourse, (inspired by Hayden White's Metahistory[67]) has finally

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[65] Friedrich Kittler, Gramophone - Film - Typrewriter, Palo Alto,
     Cal. (Stanford UP) 1999, 5
[66] Vilém Flusser, Die Schrift. Hat Schreiben Zukunft?, cited in
     Strohl, Introduction, in: Vilém Flusser, Writings, Minneapolis
     (Univeristy of Minnesota Press) 2002, xxxiii
[67] Hayden White, Metahistory. The historical imagination in

resulted in reflections about alternative ways of writing media-in-time. Again, Hayden White has sharpened the analytical attention. Telling is not just about stories, but about counting as well (the writing mode of digital media), as becomes evident by an anamnetic reconsidering of historiography. Early Mediaeval forms of registering events (the Annalistic tradition as opposed to chronicles and historiography proper) convey a way of experiencing reality not in terms of continuous but in discrete time[68], thus closer to state-based automata with discrete writing/reading of symbols on an endless divine memory tape (which is, of course, the diagram of the Turing Machine).

New media phenomenology, by combining recent research in neuro science on brain temporalities[69] with the Husserlean definition of temporal experience (pro- and retention), couples technologies with the human experience of affective temporalities.[70] Already Marshall McLuhan's notorious theorem of the "acoustic space" opened the notion of electrified media. In media art like Bill Viola's works the "cinema-digital-video hybrid technique exposes the viewer to minute shifts in affective tonality well beyond what is visible to natural perception"[71]. Let us take this *tonality* literally: There is a sound in electronic media, with the sonic not taken in its physical (acoustic, audible) but in its epistemological sense: being an expression of tempor(e)alities. The privileged relation between sound and technological media is grounded in their analogous time-basedness and chrono-poietical time-basing.[72] New media articulate (themselves in) time, which is their musicality.

    nineteenth-century Europe, London / Baltimore 1973
[68]   Hayden White, The Value of Narrativity in the Representation of Reality, in: Critical Inquiry vol. 7 no. 1 (autumn 1980), 5-27
[69]   On the neuro-processual time frame ("window of simultaneity") which counts as the human experience of "presence" see Francisco Varela, The Specious Present. A Neurophenomenology of Time Consciousness, in: Jean Petitot / Francisco J. Varela / Bernard Pachoud / Jean-Michel Roy (eds.), Naturalizing Phenomenology. Issues in Contemporary Phenomenology and Cognitive Science, Stanford, Cal. (Stanford UP) 1999, esp. 272f and 276f
[70]   See esp. Hansen 2004, chap. 7 "Body Times", 235-268
[71]   As paraphrased by Tim Lenoir, "Foreword" to Hansen 2004, xxvi
[72]   **See Bill Viola, The Sound of One Line Scanning, in: Dan Lander / Micah Lexier (eds.), Sound by Artists, Toronto / Banff (Art Metropole & Walter Phillips Gallery), 1990, 39-54. While entries like time, temporality and vision figure prominently in the "index" of Hansen's book, what is missing is the "acoustic", the "sonic", "sound media time".**

New options of navigating in archives of audiovisual times past

Once being digitized, the electronic image is open to almost real time access and new search options like similarity-based image retrieval. From this derive options of searching new kinds of archive which are not simply alphabet-based any more but signal-based like phonographic records or the electronic video image on magnetic tape. The traditional architecture of the archive is based on classificating records by inventories. This is being replaced in the digital media by order from fluctuation, that is: dynamic order. But this is an "archive" no more, but algorithmically ruled processuality.

On the borderline of digital addressability, it is possible now to navigate through large amounts of audiovisual data beyond verbal language, an im-mediate access to sound and images, unfiltered by words. Images and sounds thus become calculable and capable of being subjected to pattern-recognition algorithms. Such procedures will not only media-archaeologically "excavate" but as well *generate* unexpected optical statements and perspectives from an audio-visual archive that can, for the first time, organize itself not just according to meta-data but according to its proper criteria - visual memory in its own medium (endogenic). The notion of „excavating the archive" in terms of media-archaeology (instead of iconography) is not meant to be a metaphor.[73] What is being digitally „excavated" by the computer is a genuinely code-mediated gaze on a well-defined number of information patterns which human perception calls "sound" or "images". Contrary to traditional semantic research in the history of ideas, such an audio-visual archive will no longer list sound & image sequences according to their authors, subject, and time and space metadata of recording. Instead, digital data banks will allow audio-visual sequences to be systematized according to genuinely signal-parametric notions (mediatic rather than narrative *topoi*), revealing new insights into their informative qualities and aesthetics.

Epistemogenic things: Listening to the monochord

There are epistemognic things like the setting in a laboratory which is the *dispositif* for knowledge to emanate.[74] In reverse, from a media-archaeological point of view, there is (technologified) knowledge materialized, embedded and implemented

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[73] For Michel Foucault, the term archaeology explicitly "does not relate analysis to a geological excavation": Foucault 1972: 129

[74] Hans-Jörg Rheinberger, Experimentalsysteme und epistemische Dinge, Göttingen (Wallstein) 2001; same author, Experiment, Differenz, Schrift. Zur Geschichte epistemischer Dinge, Marburg (Basilisken) 1991, chap. IV "Das `Epistemische Ding´ und seine technischen Bedingungen", 67ff

within operative media themselves which deserves to be extracted and derivated by explicit academic inquiry and verbalization.[75]

See e. g. the *phonisches Rad* as element in the otherwise optically oriented electro-mechanical image transmission Nipkow system.[76] The electro-magnet "phonetic" wheel (inside the apparatus) is meant to synchronize the image lines here between transmitter and receiver - a kind of *tuning* by *resonance*. The sonic is rather implicit here (with no sound to be heard), as implicit chrono-technical sound knowledge (sonicity), while visible tuning here takes place with the stroboscopic disc (attached to the Nipkow disc) which is on the front side ("Interface") visible to the user parallel to the actual television image. The message of the medium process is *timing* here.

[see W. E., EXPERIMENTING MEDIA-TEMPORALITY. Pythagoras, Hertz, Turing, in: W. E., Digital Memory and the Archive, Minneapolis (University of Minnesota Press) 2013, xxx-xxx]

When we re-enact Pythgoras' experiment with the monochord in the 6th century B.C. today, that is: when we mechanically sub-divide and musically activate such a string, we actually re-enact the techno-physical insight of the relation between integer numbers and harmonic musical intervalls which once led Greek philosophers to muse about the mathematical beauty of cosmic order in general (including the rejected experience and fear of [deviation of this aesthetic ideology resulting in] the "Pythagorean *komma*", that is: irrational numbers). We are certainly not in the same historical situation like Pythagoras, since the circumstances, even the ways of listening and the psycho-physical tuning of our ears, is different. But still the monochord is a time-machine in a different sense: It lets us share, participate at the original discovery of musicolgical knowledge, since - in an almost Derridean sense (expressed in his *Grammatology*) - the repeatable *is* the co-original.[77]

In the Italian re-naissance of such ancient knowledge,

Vincenzo Galilei undertook a number of experiments with a lute to investigate the nature of musical harmonics[78] - a kind of media-

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[75] This is the special Media Studies training and task within the Faculty of Humanities as different from the engineering and mathematical disciplines.

[76] E. g. the Nipkow-Televizor (30-line), produced by the Tratri Novakove Company in Prague, 1934, on display in the *60 Years of Television Broadcasting* special exhibition at the National Technical Museum, Prague, May-December, 2013)

[77] Martin Heidegger, Sein und Zeit, xxx, 385: "Die Wiederholung ist die ausdrückliche Überlieferung, das heißt der Rückgang in die Möglichkeiten des dagewesenen Daseins."

[78] As described in: Vincenzo Galilei, A Special Discourse

based archaeology of the acoustic: "Galilei employed the lute here not as a musical instrument but as a piece of laboratory equipment [...]." Once within experimentation time, it can be re-enacted. On the diagrammatical level, the re-enactment is time-invariant; on the operative level of implementation, the materiality of the medium itself seems to impose certain vetoes rooted in the historicity of the instrument, but in fact, the epistmological operation remains intact in principle (that is: *archaeo*logically): Claude V. Palisca set out to replicate this experiment using a lute built in the 17th century by an unknown maker. "The present condition of the instrument required the use of some substitutions for the mateirals originally used by Galilei in his experiment; however, these did not affect the basis tenets of the experiment."[79]

Once human senses are coupled with technological settings, one is within their autopoietic temporal field, a chrono-regime of its own dynamics (or mathematics, when data are registered digitally). Such couplings create moments of literal ex-ception: Man is taken out of the man-made cultural world (Giambattista Vico's definition of "history") and confronts naked physics.

On the one hand, any experimental "event" is a singular and instant act which cannot be subsumed under general terms. On the other hand, in Martin Heidegger's late philosophical work, the fundamental notions of *being* (Sein) and *time* (Zeit) converge in the notion of the *event* (Ereignis).[80] In this double sense, the experiment allows a unique experience and at the same time for com/munication across the temporal gap (bridging a temporal distance. In the processual moment of the re-enacted experiment, we share the same temporal *field* (a notion which implicitely refers to the episteme of electromagnetic dynamics).

Can such experimentation be extended to macro-temporal eventality as well? At first glance, experimentation does not give access to historical experience, since past culture can not be re-enacted (except in experimental archaeology, maybe). This is the argument of historians usually applied to differentiate their hermeneutic discipline from the natural sciences. Hermann von Helmholtz

Converning the Unison, trans. in Claude V. Palisca, The Florentine Camerata. Documentary Studies and Translations, New Haven / London (Yale University Press) 1988, 203-205 (Italian text on pp. 202-204)

[79] Claude V. Palisca, Was Galileo's Father an Experimental Scientist?, in: Paolo Gozza (ed.), Number to Sound. The musical way to the scientific revolution, Dordrecht / Boston / London (Kluwer) 2000, 191-199 (195)

[80] See Martin Heidegger, Beiträge zur Philosophie (Vom Ereignis), [= Gesamtausgabe III. Abt. Unveröffentliche Abhandlungen Vorträge – Gedachtes. Bd. 65.], Frankfurt/M. (Klostermann), 3rd edition 2003

declares at the climax of historicism in Germany:

"Die Beziehung auf die Geschichte der Musik wird <...> auch deshalb nötig, weil wir hier Beobachtung und Experiment zur Feststellung der von uns aufgestellten Erklärungen meist nicht anwenden können, denn wir können uns, erzogen in der modernen Musik, nicht vollständig zurückversetzen in den Zustand unserer Vorfahren, die das <...> erst zu suchen hatten."[81]

But media-archaeological experimentation (simulation as opposed to historiograpic historicism) gives access to the invariant elements of knowledge in time: a kind of

"<...> 'Experimentalisierung der Geschichte' in Simulationen. Sofern im Rahmen von Medienarchäologie und Simulationstechnologie heute ganze Theorien simulierbar sind, beginnen wir beständig tunnelartige Verbindungen durch die Historie <cultural time> zu graben, wodurch selbst unwägbar scheinende Zusammenhänge erkennbar werden und erforschbar sind. Indem wir aber Zeitobjekte vergangener Zeiten als solche reinstanziieren, läuft das "Wissen von der Musik" immer mehr selbst und von selbst in Musiktechnologie."[82]

Such "tunneling" brings us back to ancient music.

On *sonicity*: Sound as epistemic object of (media) analysis

In assuming the epistemological dimension of sonic memorization, the analysis goes far beyond to simply doing justice to *auditory memory* which indeed "has been largely neglected in memory studies in favour of visually-oriented arts of memorization [with their long tradition within rhetoric (ars memorativa)]"[83].

Let us take as example how "Piano Tuners Have Built a Bridge To 18th Century".

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[81] Hermann von Helmholtz, Die Lehre von den Tonempfindungen als physiologische Grundlage
für die Theorie der Musik [*1863], Braunschweig (Vieweg) 1913, 411

[82] Martin Carlé, Geschenke der Musen im Streit ihrer Gehörigkeit. Die antike Musiknotation als Medium und Scheideweg der abendländischen Wissenschaft, in: MusikTheorie. Zeitschrift für Musikwissenschaft, vol. 22, no. 4 / 2007 (thematic issue "Peri mousikes epistemes - Zur Aktualität des antiken griechischen Wissens von der Musik, edited by Sebastian Klotz), 295-316 (313f)

[83] As defined in the call for papers to the workshop *Auditory Memory and Sound Archives from the Late-Nineteenth Century to the Present*, University of Amsterdam, 18 February 2013

[Katie Hafner, Piano Tuners Have Built a Bridge To 18th Century, in: The New York Times, published February 17, 2000[84]]

Electronic tuning allows to change a piano's tuning (its "temperament") with ease from universal "equal temperament" to time-specific ratios.

"Modern pianos are tuned in ''equal temperament,'' which divides each octave into twelve equal half-steps. The frequency of a note is adjusted up or down, sacrificing some harmony in all keys so none are too dissonant.
On the other hand, in many tunings that were popular in the Baroque period, intervals are extremely pure in some keys at the expense of others, increasing the dissonance in those keys.

[When Bach wrote his famous ''Well-Tempered Clavier,'' pieces that exploit the 24 major and minor keys in which they were written, in the first half of the 18th century, it gave rise to the term ''well temperament.'' That tuning scheme, although not an example of absolute equal temperament, was a departure from earlier tunings and allowed keyboardists to play all the pieces without retuning the instrument.]

Equal temperament is now universally accepted but a compromise. Variable temperaments are essential to unlock the emotional charge of earlier music." Techno-mathematical re-turing of instruments (even in microtones) serves thereby as true media archaeology of the sonic past.

"Sing me, Muse, the deeds of a man called Odysseus", Homer's epic starts. What if memory is not only actually sung (known as "oral poetry") to be later registered and displaced in writing symbols which replace (and "technologize"[85]) the oral signal with all its rich overtones (tuning, pitch, timbre, rhythm), but essentially sonic in itself?

Erkki Kurenniemi is "an unsung" pioneer of electronic art, the back cover (endorsement) of the DVD *The Dawn of Dimi* articulates[86], quoting *The Wire* (January 2003): "Viewed from a historical perspective, Kurenniemi's music foretold digital directions in rhythm, noise and jumpcut editing, only back then no-one was

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[84] = http://www.nytimes.com/2000/02/17/technology/piano-tuners-have-built-a-bridge-to-18th-century.html?pagewanted=all&src=pm (accessed July 11, 2013)
[85] In the sense of Walter Ong, Orality and Literacy. The Technologizing of the Word, London (Methuen) 1982
[86] Published by Kinotar Oy and Museum of Contemporary Art Kiasma, Helsinki 2003; Editor: Mika Taanila

listening." Is there a "historically" delayed listening? Yes and no: not historically (since this cognitive sphere is a function of historiography and the alphabetically recorded and organized archive), and yes: temporally delayed, reminding of the physically given evidence that every "presence" of aural listening already involves the delayed transfer of acoustic vibrations through air with a speed of around 330 meters/sec. - *medium* time in terms of Aristotle's "acoustic" definition of physical media.

Sonic eventality is not only time-based, but in a more radical reading it leads humans to experience time at all.

The neo-logism of "sonicity" aims at catching "sound" as an epistemological rather than musicological object of knowledge from a media-philosophical perspective).

Inquiring *sonicity* does not equal Sound Studies. The audible section of the bandwith of sonicity (acoustic sound) is just the deceptive top of the ice berg above the water level, or comparable (in less "layer" metaphors) to the visible part of the electromagnetic spectrum which animals perceive as "light".

Das Sonische, a neo-logism in German language (different from *Klang* which is acoustic "sound") in this context refers to the inaudible vibrational ("analogue") and rhythmic ("digital") field (*Sonik*).

Sound as epistemological form of timing refers to continuous ("analog") vibrational and discrete ("digital") frequential dynamics of all kinds, ranging from the most precise (electro-)physical micro-moment over the human affect of temporal perpection up to repercussions of what traditionally (fixed by writing) used to be called history. But to understand the ways that media inscribe themselves on our bodies, we need a philsophy of time that recognizes the production of a different time-writing. "Before the phonograph, no sound had the option bot the be fugitive. A historical rupture in the nature of sound arises that, in turn, rewrites its entire history."[87] But maybe this irritation is more fundamental: not just a historical rupture, but a rupture of the privileged dominance of historical discourse over the phenomenology of emphatic time as such. The generation of vocal or even musical "presence" of cognitively known absence induced by the phonograph does not simply ask for a re-writing of media historiography, but requires different ways of writing temporal figurations as such - a kind of archaeography which the oscilloscope making visible sonic wave forms performs for long time already.

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[87] Peters 2004: 193

Sound and music let us experience transient time and even time-invariant affects. It is this processual experience which the sonosphere shares with high-electronic media. Just like culture tries to save sound and music itself from its ephemeral temporality, signal recording media for the first time in cultural history mastered the time axis towards arbitrary manipulation.

The term "sonicity" does not refer to the apparent phenomenological quality of sound but rather to its essential temporal nature which is its subliminal message behind the apparent musical content.[88]

Nicole Oresme's late medieval *Tractatus de configurationibus qualitatum et motuum* defines the "sonus" in its physical materiality as a function of the time axis[89] and thus comes close to the present definition of sonicity as epistemic articulation. The diffuse genealogy of the term *sonus* ranges from the concrete physical materiality of sound up to its epistemological definition[90] for which the neologism *sonicity* might be allowed.

Sonicity refers to knowledge about implicit periodically varying functions of time.[91]

In reverse, acoustic sound - in order to be communicated beyond its natural physical limits - must be technically transduced in order to fit to a technical channel such as the telephone line or electro-magnetic radio waves. While passing as transduced signal (voltage-controlled current), sound is in its implicit state.

Volatile sound and speech must be converted implicit in order to pass the channel of cultural time and "historical tradition": it must either be signal-recorded in phonography or symbolically

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[88] This argument refers both to Marshall McLuhan's central argument ("the medium is the message") in *Understanding Media* (1964) and to Martin Heidegger's epistemology of technology's essence, in: The Question Concerning Technology and other Essays, New York (Harper and Row) 1977

[89] "[...] aliam vero extensionem habet [sonus, et] motus, a tempore, que nunc vocetur longitudo ipsius soni": Nicole Oresme and the Medieval Geometry of Qualities and Motions, ed. by Marshall Clagett, Madison, Milwaukee / London (Univ. of Wisconsin Press) 1968, Book II, chap. 15 *De natura et difformitate sonorum*, 306

[90] See Frank Hentschel, entry "Sonus", *online* www.sim.spk-berlin.de/static/hmt/HMT_SIM_Sonus.pdf (accessed July 2013)

[91] In that sense, John Durham Peters writes of "sonic revelations" of the vibrational qualities of the human eardrum by Hermann von Helmholtz' artefactual resonators (Resonatoren): Helmholtz, Edison, and Sound History, in: Lauren Rabinovitz / Abraham Geil (eds.), Memory Bytes. History, Technology, and Digital Culture, Durham / London (Duke University Press) 2004, 177-298 (185)

coded by musical notation.[92]

According to Marshall McLuhan, telephone, gramophone, and analogue radio were "the mechanization of post-literate acoustic space"; in fact: "We are back in acoustic space".[93] McLuhan declared on the climax of analogue electronic broadcast media culture. "Sonic" space is understood here as the epistemological existence of sound, somewhat opposite to the term in physics.

The term "sonic epistemologies" itself is already awry; ancient Greek *epistemé* is already triggered by the visual bias of alphabetic writing (as defined by McLuhan 1962).[94]

Therefore, no. 4 of the Journal for Sound Studies (JSS) is a special issue devoted to *Sonic Epistemologies* which is sometimes called "acoustemic" already.

Marshall McLuhan made a crucial discovery about the intrinsically "acoustic" structure of electronic mediascapes.

The immediacy of electricity has been valued essential by McLuhan as the definite difference to the Gutenberg world of scriptural and printed storage of information:

"Visual man is the most extreme case of abstractionism because has has separated his visual faculty from the other senses <...>. <...> today it is threatened, not by anly single factors such as television or radio, but by the electric speed of information movement in general. Electric speed is approximately the speed of light, and this consitutes an information environment that has basically an acoustic structure."[95]

Very media-archaeologically, McLuhan's terms "basic" and "acoustic structure" evidently refer to an epistemological ground, not to the acoustic figure in its phenomenological body-related sense.

In an epistemological sense, the sonic is not about (or limited to) the audible at all, but a mode of revealing modalities of temporal processuality, up to the "superstring" theory of today. Already Henri Bergson formulated his dynamic idea of matter in the sense of vibrating waves and frequencies.[96]

"The *message* or effect of electric information is acoustic"

[92] See Peters 2004: 188
[93] McLuhan, "Five Sovereign Fingers Taxed the Breath" (1954)
[94] Tatsächlich führt die Altphilologie das griechische *gignóskein* (das Erkennen eines Gegenstandes als sein Erzeugen) auf den Zusammenhang mit Begriffen des Sehens, des Auges, zurück.
[95] Letter to Barbara Ward, 9 February, 1973, in: McLuhan 1987: 466
[96] Henri Bergson, Matière et Mémoire, Paris 1898; in English *Matter and Memory*, 276: matter = vibration

(McLuhan) - even when it is perceived as an electronic "image" - as defined by the video artist Bill Viola in his essay "The Sound of One Line Scanning"[97].

McLuhan's "acoustic space" is oscillating time and implicitely returns in Gilles Deleuze's "interval" philosophy.

But information in "online" worlds come a-simultaneous from topological directions which recalls a different structure of the act of *hearing*.

"Sonic" tempor(e)alities unfold on the level of packet switching in the "social net": "Temporalities of flows, bursts, and various techniques and techologies of time management [...] is what characterises the specificity of reproducing existing worlds in network culture."[98]

So let us listen to how "prosodic" communication in the World Wide Web sonds like on its basic media-archaeological level, its signal clocking in terms of *dactyles*:

All of the sudden, one of the oldest figures of prosody in occidental poetic speech returns as implicit sound of digital tele-communication - true *technopoiesis*.

Sonic tempor(e)alities

In fact, the sonic ground of the electronic image is "hidden" in the media-archaeological and Heideggerean (*aletheia*) sense: "It is acoustic. It resonates. But this is a hidden ground, because superficially people think they're looking at a visual program. And they're not. They're not looking at all - they're absorbed, involved in a resonating experience."[99] So-called immersion is rather into a *sonic* than visual sphere.

There are two kinds of carrying sound and music through time: musical memory as symbolically notated in scores (the archive) and sonic memory preserved in signal-based recording media (starting with the Edison phonograph) which are endowed with "temporal indexicality" (Thomas Y. Levin). Media temporality refers both to

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[97] Bill Viola, The Sound of One Line Scanning, in: Dan Lander / Micah Lexier (Hg.), Sound by Artists, Toronto / Banff (Art Metropole & Walter Phillips Gallery), 1990, 39-54

[98] Abstract to Jurri Parikka, Of Queues and Traffic: Network Microtemporalities, lecture at the Glasgow Memory Group symposium *Digital/Social Media and Memory*, April 17th, 2013

[99] Marshall McLuhan, in: Letters of Marshall McLuhan, selected and edited by Matie Molinaro / Corinne McLuhan / William Toye, Toronto / Oxford / New York (Oxford University Press) 1987, 177

the symbolical ("digital") and the physically real ("analogue")
regime - like the clocking of computers and the "Time-To-Live"
which in the Internet for data packets decides about the success
of communication in virtual, that is: calculated space.

In the world which is experienced by all of us as presence we
observe an implosion of the despotic signified "time" into a
multiplicity of times and timings in the sense of chrono-poetics.

This time machine (not in the sense of time-travelling, but of
time-generating mechanisms) is sonic by nature. The term "sonic"
here refers to the two bodies of dynamic tempor(e)alities: the
wave form and the digital, that is: mathematically intelligent
(algorithmic) manipulation of numerically addressable frequencies.

[Music is a) a kind of "sonification" of time, b) time-based
itself, and c) a time-generating articulation (beat, rhythm).]

Music when effectively, that is: physically implemented in
operative media is in itself *a priori* already, a sonic
Versinnlichung as the temporal affect. In a more advanced
interpretation, sound is even a soni*fiction* of time in the strict
sense of Latin *fictio*, since it *generates* temporality.[100]

Different from functional sonification as defined by Gregory
Kramer as "the use of nonspeech audio to convey information"[101],
sonicity is about *implicit* acoustics – like the Pythagorean
notion of sound as number[102] which is the "acoustic" in McLuhan's
implicit audio sense - a processual mode taken as epistemological
term.

The present music field - be it experimental popular music or
avantgarde compositions - is characterized by an aesthetic
multiplicity which extends the limits of human perception to
infra- and ultra sound and to micro-temporal events.[103] This pushing

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[100] See W. E., Chronopoetik. Zeitweisen und Zeit*gaben* technischer
    Medien, Berlin (Kulturverlag Kadmos) 2012
[101] "More specifically sonification is the transformation of data
    relations into perceivged relations in an acoustic signal for
    the purposes of facilitating communication or interpretation":
    Gregory Kramer et al., Sonification Report. Status of the field
    and Research Agenda, *online*
    http://sonify.psych.gatech.edu/publications/pdfs/1999-ns-f-
    report.pdf (Januar 2013)
[102] Dazu Paolo Gozza (ed.), Number to Sound. The Musical Way to the
    Scientific Revolution, Dordrecht / Boston / London (Kluwer) 2000
[103] On "sonic" time, see chap. 9 "Toward a Media Archaeology of
Sonic Articulations", in: W. E., Digital Memory and the Archive,
edited and with foreword by Jussi Parikka, Minneapolis / London
(University of Minnesota Press, Reihe Electronic Mediations, Bd.
39), 172-183

of sonic limits is itself a effect of the almost infinitive
flexibility of digital technologies. Thus it makes sense to extend
the term "sonic" to non-acoustic time-based eventalities:
vibrations and their mathematical reversal which is frequencies.

[The (h)ear(ing apparatus) is much more sensitive to micro-
temporal (time-critical) processes than the eye. While the
flickering of an electric bulb (50 times/sec.) can not be noticed
by the after-image in the eye any more (the cinematographical
effect), the rising of acoustic pitch from 50 to 100
oscillations/sec. is very well perceived indeed.]

This hits a deep epistemological dimension. If the experience of
being is not a static one (ontologic), but rather processual
(being-in-time), then the definition of existence as "being tuned"
("Durchstimmung" with Heidegger) recalls sonic resonance.
"Stimmung", in German, relates both to the voice ("Stimme") and to
the tuning ("stimmen") of an instrument - constituting "sonic"
media temporality.

"In order for one person to understand what another person says,
he must be 'in tune' with him. [...] such intrapersonal synchrony
is far more fine-grained than that of any *corps de ballet*."[104] This
gives a sonic meaning to the common insight that "all
communication is a function of social context"[105].

Let me fundamentally question the historicity of sound, arguing
for an archaeology and insist that in many respects sound – heard,
recorded or transmitted – is radically ahistorical; its
specificity could not be captured and subsumed by the logocentrism
of traditional narrative historiography. Serious engagement with
"the sonic" – sound as sound and sound as time – provides access
to a plurality of non-narrative temporalities.

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[104] Alan Lomax / Irmgard Bartenieff / Forrestine Paulay,
Choreometrics. A Method for the Study of Cross-Cultural Pattern
in Film, in: Ronald D. Cohen (ed.), Alan Lomax, Selected
Writings 1934-1997, New York / London (Routledge) 2005, 275-284
(278), referring to: W. S. Condon / W. D. Ogston, Film Analysis
of Normal and Pathological behaviour, in: Journal of
Neurological and Mental Diseases, vol. 142, no. 2 [Jahr xxx], p.
237
[105] Lomax 2005: 277f