[Wolfgang Ernst: SCRIPTS ON TECHNICAL MEDIA]

TEXT BLOCK "TECHNICAL STORAGE AND TECHNO-ARCHIVE"

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"TECHNICAL STORAGE AND TECHNO-ARCHIVE"

Archival States:

ARCHIVAL STATES

Archival states: *l'archive*

Archival "states" is a double-valued expression. On the one hand, the notion refers to the fact that the memory of the state consists of institutionalized archives (the *archeion* since Greek antiquity) where it consists of symbols (alphabetic letters and more recently alphanumerically coded documents). In a more media-archaeological meaning, "archival states" refers to the essence of technical memories which consist of discrete data sets which are being discontinuously reconfigured or refreshed - like a Turing machine. Hegel once differentiated between a mechanic memory and organic re-membrance. The archival *apparatus* is hardware; ideology takes place in its very configuration already. Its software is narratives (historiography) which operate upon these data.

Michel Foucault's very distinctive use of the term *l'archive* in his

Archéologie du savoir (Paris 1969) does not refer to the totality of all received documents[1] nor its bureaucratic institutions but, more abstracted, the systems which governs the emergence and the processing of enunciations. Applied to the technological condition, *l'archive* deals with hardware configurations, protocols, the diagram that formalizes processes, its tectonics as an active rather than passive agency of storage and transfer of signals and symbols. The technical act of archivization produces as much as it records the event[2] - *archivologically*.

Mechanization of the archive: The Weimar Republic and data processing in the Third Reich

Already during World War One in a highly mobilized economy, the only way of reducing entropical complexity to order occasionally was the flat storage of documents by *numerus currens* (the pure temporal order of occurrence) or by key-terms, replacing meaningful archival structures by pure series, reflecting the order of the temporal real itself. It required sophisticated tools of inventories to link the information on files to the actual location of data, providing an address system (vital for all operations of memory) which is not unfamiliar to data storage in *computing* today. At the end of the 1920s, the flux of incoming files exceeded the real-time registering capacities of the archivists; therefore, the system switched to registering incoming files simply according to incrementing the access number, the *numerus currens*. Memory became a function of address spaces: "Eine Konkordanz sollte dann dafür sorgen, daß die Kluft zwischen Lagerung und Verzeichnung überbrückt wird, die Auffindung einer Lagernummer in einem Findbuch durch eine Liste [...]."[3]

The metaphor of the "archival body", expressing a somewhat historicist idea of the archive, has been replaced by the machine. Indeed, archival data processing became mechanical - the very condition for the subsequent implementation of hardware systems like the punched card.

The traditional archive so far had rather been a cultural technique, the engineering of administrative memory. But with the introduction of punched-card tabulating machines, the Hollerith machines (operated by IBM), which were originally introduced around 1900 to speed up the calculations of the US census but since 1933 used to filter data of Jewish population in the National Socialist regime of Germany as well, the automatization of retrieving archival mass-data has been an issue which led to speculations on the cybernetization of archival memory.[4]

1 Michel Foucault, Archaeology of Knowledge, New York 1972, 130
2 Jacques Derrida, Archive Fever: A Freudian Impression, trans. Eric Prenowitz (Chicago and London: University of Chicago Press, 1996), 16 f.
3 Scriverius, 59 f.
4 See Edwin Black, IBM and the Holocaust, New York (Crown) 2001

The archive becomes medium in a strict sence only when it is part of a circuit with feed-back options ("online"). Thus the title of the company journal of Dehomag Berlin (the German branch of IBM) is not just metaphorical: *Der Stromkreis* (The Circuit of Current). This corresponds with the memory model of capitalism; according to the systems theory of Klaus Krippendorff[5], capitalism simply demands for a memory system of *reverberating circuits* which are permanently refreshed and fed back into the system operations - as opposed to totalitarian societies based on "memory involving records", demanding for permanent archives and the storage principle. Here we come to a critical point: as long as the general data from the *Reich* census of May 17 were registered and calculated separately from the additional data on racial matters (genealogical origin) in the single households, the tabulating machines were not directly coupled with the deportation program.[6] It was the head of statistics at the SS who asked for a punched card technology equipment for his department, referring to the successfull use of such machinery at the Statistisches Reichsamt, Reichsbahn, Reichspost, Reichsbahn, and research institutions like Rasseforschung. Here comes the difference, which separates automated data propcessing from archival procedures: "The organization of file keeping today excludes any possibility of fast, time- and work-efficient data processing. In order to answer a single aspect of racial data retrieval, it would take a months-long search."[7] As opposed to the old archival system, data processing by the medium of punched cards technology could answer any question almost immediately - the archive became time-critical.

Archival memory of the GDR

The collapse of the East Berlin regime in autumn 1989 suddenly confronted the West German state archives with a mass of unreadable electronic data from the GDR, coinciding with the transformation from paper records to digital memory in administration itself. The apparent return of history as event in 1989 on the political level coincided with the end of the traditional recording system of historiography - alphabetic writing.

The collapse of the East German regime in 1989/90 resulted not only in a political but radically media-archaeological discontinuity. All of the

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5 Klaus Krippendorff, Principles of information storage and retrieval in society, in: General Systems vol, 20 (1975), 15-34
6 See Friedrich W. Kistermann, Locating the Victims: The Nonrole of Punched Card Technology and Census Work, in: IEEE Annals of the History of Computing, vol. 19, no. 2, April-June 1997
7 "Vorschläge zur Erfassung des im RuS-Hauptamt ruhenden erbwissenschaftlichen und bevölkerungspolitischen Materials", November 11, 1941, p. 2, Federal Archives Berlin, NS 48/6

sudden, parts of the memory of the GDR were not legible any more - as if the opening of the Brandenburg Gate induced a closing of the archive. Electronic data from former GDR computers without description have partly been thrown away by the West German Federal Archives (still in Koblenz); without code which teaches to cut bit strings into meaningful sections, such lists are useless and illegible. In case such a description is preserved, the Federal Archives try to preserve the data independent from both hard- and software (current programs are not being stored for being outdated soon), as flat files, as sequential strings of bits, accompanied by the necessary minimum of metadata.

„The experience with securing East German data files showed that the creating organizations were not the best custodians of machine-readable archives. Many data files were no longer legible and data documentation was at least incomplete or missing in most cases. Federal offices only cared for these electronic records in so far as they could use them for their purposes."[8] Luckily (for preservation of electronic memory), electronic data from the GDR were kept in modes close to the machine (having been written in Assembler code); unluckily, this implies a strict dependency on *Robotron* hardware which is museum pieces now. Which state archive keeps the relevant hardware for reading such a new type of documents as well? All of the sudden, parts of the memory of the GDR are not legible any more. Electronic data from former GDR computers without accompanying program description are hermeneutically worthless, while still technically readable as signals, media-philologically decode. Without code which teaches to cut streams of bytes into meaningful sections, such lists are useless and illegible. In case such a description has been preserved, the Federal Archives try to preserve these data independent from both hard- and software for future use, as "flat files", that is: sequential strings of data, accompanied by the necessary minimum of metadata to make them executable again at all.

The katechontic function of archives, access to (East German) memory and the new electronic wall

Nowadays, CCTV surveillance systems record and store video images to a digital video recorder or (in the case of IP cameras) directly to a server. The retention period of the images produced by CCTV systems (subject to compression ratios and images stored per second) is delayed present in the sense of closed-circuit contemporaneity. "Recordings may be retained for a preset amount of time and then automatically archived,

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8 Michael Wettengel, German Unification and Electronic Records: The Example of the „Kaderdatenspeicher", lecture at Annual Meeting of the Society of American Archivists, Washington, D.C., 2. September 1995, session 59: Bit by Bit: Perspectives on Managing Electronic Records; fothcoming in: Seamus Ross / Edward Higgs, Electronic Information Resources and Historians: European Perspectives, Oxford UP 1996, quoted here after the typescript, p. 2

overwritten or deleted, the period being determined by the organisation that generated them."[9]

Against the physical tendency of matter to dissolve into disorder, culture (the symbolic order) operates by creating and maintaining literally un-natural states such as time-invariant storage, protecting *l'espace de l'archive* (de Certeau). Temporary blockage ("Sperrfrist") is the logical (symbolical) or physical (*off-line*) dis-connection from archival access. The binary opposition between opening and closing of archival gates, or between storage and transmission, has been dialectically suspended by the technical concretizations of delay, *Delta t*, intermediary storage: the RAM in computing, the delay line in signal transmission.

Preserving access to data, especially the files of personal surveillance, has been a crucial political issue in the creation of the State Security ("StaSi") archives when the GDR collapsed in 1989 / 1990. With the collapse of the GDR, for its records memory, a new kind of electronic wall built up indeed. With the incompability of Estern and Western operating systems and data storage methods, whole sections of the former GDR's Secret Service ("Staatssicherheit") archives, all of the sudden, were not legible any more - as if the opening of the Brandenburg Gate induced a closing of the archive. Electronic metadata of files processed in former GDR computers were deliberately destroyed by the revolutionary committees of 1989-90. Nowadays, for the Federal Archives in Bonn and Berlin, magnetic tapes without the code containing the instructions to convert bit strings into meaningful sections are useless and illegible. Special programs for rendering these data banks legible as character strings may be written; at present they can be electronically read, but not be understood - a media-archaeological situation.[10] When memory transforms into digital *latency* within computer codes, the ancient notion of "secret", *Privy* State Archives, recur on a technological level as *arcanum imperii*. This unreadability of electronic files does not only relate to software, but to the hardware of memory as well. Who will preserve (or emulate) the digital memory machines themselves, the discontinued generations of former socialist East Europe ESER system computers?

In the future, special programms for rendering these data banks legible as texts may be written; so far they can be machine-read, but not be hermeneutically understood - a literally media-archaeological situation, data latency, re-addressing the question of information access, the ultimate „postmodern" challenge, on the electronic level. Already in 1979, when answering *La question postmoderne*, Lyotard emphasized

9 https://en.wikipedia.org/wiki/Closed-circuit_television; accessed December 12, 2016
10 Michael Wettengel, German Unification and Electronic Records: The Example of the "Kaderdatenspeicher", in: S. Ross and Ed. Higgs (eds.), Electronic Information Resources and Historians: European Perspectives, St. Katharinen (Scripta Mercaturae) 1996

that accessability to data banks will be decisive for future political culture[11] - rather than anachronisms like material (Berlin) walls.

MEDIA ARCHIVOLOGY

Re-entry of the alphabet: media archivology

Archives and other storage agencies are not in the past, but they are radically present. A theory of storage does not confuse storage media with "cultural memory", or even human "remembrance". Archives, libraries and museums are symbolical machines, while at the same time, they differ in their function between respositories of material objects (museums), places of unique records (archives) and collections of public reproductive knowledge (libraries).

There is a difference between the book as material storage medium for symbol transmission and as a (data) format (like the ancient codex with single pages different from the papyrus scroll). It will be dis-continuously "migrated" to new carriers and interfaces - each time a "catastrophe" (data loss). On a more fundamental media-archaeological level, there is a return of the printed alphabet - which seemed to be out-dated by signal recording and transmission in audio-visual media like the phonograph and electronic radio and television broadcasting - within computing as alpha-numeric source code and strings in computer programming; a unit of bits is even called "word" (even if this new alphabet disguised under the appearance of digital sound and images). But against the ephemerality of electronic "literacy", as a kind of retro-effect of *online* "open access" to knowledge, the material book gains strength again, as enduring object.

Archive, culture, memory, entropy, Internet, storage-to-transfer

Media archaeology does not only analyse media culture in a narrative, anthropocentric ways; it rather takes the presence of the archive itself at face value, not history as imaginary model of processing "past" data. An archivology of media is subversive of the linear causality of narrative history. In accordance with the cultural semiotics developed by Jurij Lotman and the Moskow-Tartu-school, culture is a function of its memory agencies; Lotman has defined culture as a function of its inherent media, institutions and practices of storing and transferring cultural knowledge. Even closer to the physics of culture, media archaeology is concerned rather with data processing than with semiotics, with signals rather than signs.

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11 Jean-François Lyotard, The Postmodern Condition. A Report on Knowledge [*Paris 1979], Minneapolis (Univ. of Minnesota Pr.) 1984

One function of the technical archive is to take care that cultural and scientific data is being preserved for future retrieval; only the improbable re-use is *informative* since it makes a difference. In Vilém Flusser's somewhat idiosyncratic definition, culture is based on negentropical energy, the un-natural order-keeping (the archive); for media archaeology, with Shannon, entropy is rather the measure of information probability. In Norbert Wiener's *Cybernetics* (1948), information is neither energy nor matter; thus a new kind of "cultural" analysis (not energetical any more) emerges.

Is multi-media memory "archival" in McLuhan's sense that each new medium has the form or the preceding media as its content? The Internet has not yet arrived at its own media-specific memory form. Data banks organized by the World Wide Web is not about content, but rather a transversive constellation of communication. Without content, there is no need for memory; "cyberspace has no memory".[12] Only data which are provided with addressable metadata can be accessed in the techno-cultural archive[13]; in the case of the Internet, this archival infrastructure itself becomes temporally dynamical with the need for *access* data of a given moment in a virtual text. Memorial space itself is being replaced by a limited series of temporal entities. Such topologies become readically temporalized, with the archival paradigm being replaced by permanent transfer.

From the media archaeological perspective, cyber"space" is not about images, sounds or texts, but about bits; hidden behind this romantic surface which misleads by metaphors the media-archaeological mapping is to indicate (indexical rather than iconical) the real stream of data: mapping Internet protocols, depending on IP-protocols. Thus any cartographic or mnemotechnical approach is misleading. This opens new horizons for search operations in the Internet: Not just addressing and linking images and texts by alphabetical addresses, subjecting images and sound to words and external meta-data once more (the archival classification paradigm), but addressing digital images down to the single pixel from within, in their own medium, allowing for random search (apparent disorder as alternative source of information as the unexpected) - literally bit-mapping, mapping (by) bits.

Images and sounds thus become calculable and capable of being subjected to pattern-recognition algorithms. The notion of „pattern", after all, is derived from Latin *pater* - a matrix or rather patrix, a patri-archival order. Such procedures will not only media-archaeologically "excavate"

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12 Christoph Drösser, Ein verhängnisvolles Erbe, in: Die Zeit, 23th June 1995, 66
13 Axel Roch, Adressierung von Texten als Signale über Bilder. Eine Anwendung der Informationstheorie auf Buch und Bibliothek, typeskript (Berlin)

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 tagging by meta-data but according to its proper criteria - endogenic visual memory in its own medium.

What is being digitally „excavated" by the computer is a genuinely media-mediated gaze on a well-defined number of (what we still call) images - media-archaeology instead of iconographical history. This reminds of the color theory of the impressionist school of painting, as analyzed by art historian Max Imdahl in his seminal study *Farbe* (*Color*) from 1987. Its main characteristic is the „desemantization of seeing", freeing the image from its pictorial logic – an archaeological gaze indeed.[14] Media themselves thus possibly become archaeologist.

Beyond the iconicity of visual interfaces, there is algorithmic mapping. Against ideological and referential visual cartography, the archaeological gaze is a mapping gaze, as performed by Global Positioning System devices which time-critically implement the Cartesian grid into real space, mathematically instead of iconically, by numbers instead of images. The very term "mapping" is still associated with metaphorisation, visualisation, aesthetisation, against which stands the media-archaeological idea of the *operative diagram*: conceptual rather than visual, topological rather than geographical, data-based rather than narrative, connective instead of spatial; code (software) rather than surface, numbers rather than images. From location to pure address: „Only what has been stored can be located" - rather *vice versa*.[15] In this sense the Internet generates a „new culture of memory, in which memory is no longer located in specific sites or accessible according to traditional mnemonics, and is no longer a stock to which it is necessary to gain access, with all the hierarchical controls that this entails."[16] Addressability remains crucial for mediated memory. In Platon´s dialogue *Meno* „it appears as if the matter of memory is but an effect of the application of techniques of recall"[17] - *there is no memory*, rather operative functions of address spaces.

Storage versus transfer? Different data cultures

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14 "Entbegrifflichung des Sehens", ibid., 26. See Lambert Wiesing, Die Sichtbarkeit des Bildes, Reinbek (Rowohlt) 1997, chapter „Die Relationslogik des Bildes", 95-117 (112)
15 Harriet Bradley, The seductions of the archive: voices lost and found, in: History of the Human Sciences Vol. 12 No. 2 (1999), 107-122 (113)
16 Howard Caygill, Meno and the Internet: between memory and the archive, in: History of the Human Sciences Vol. 12 No. 2 (1999), 1-11 (10)
17 Caygill 1999: 2

European cultural memory is centred on archival and rather immobile material values (libraries, museums, milennia year old architecture), whereas the Transatlantic US media culture is transfer-based.

Michael Hardt's and Tonio Negri's book on power in times of global communication networks is appropriately called *Empire*. In a media-archaeological analysis of power today, the territorial notion of empire returns to the original meaning of latin *imperium* which rather means reaching out, extension, a dynamic transfer.

The US Federal Archives do not simply store documents away in an old archival privileging of secrecy, but care for a memory imperative, a very mobile offering of heritage to the public, even advertising to make this memory circulate. If there was no copyright, every online user might take advantage of the fact that in digital networks the old separation between archival latency and present actualisation of information has already collapsed.

"Mediated" memories, and the cultural record

A term like "mediated memories" is tautological. Memory, according to G. W. F. Hegel, is always already technical, a framework for storage; whereas "remembrance" (*Erinnerung*, as the German term implies) refers to a kind of "interiorized" activity which needs to be individually or culturally addressed.

Cultural records like alphabetic texts, film, music, and finally alphanumeric data banks, have always been bound to archival media; these technologies literally "govern" (cybernetically) the ways in which humans remember, territorialize and reconfigure the past. The archive itself is a storage medium; so far in occidental culture, though, narrative has been the primary mode of processing archivally stored data in the name of history, which on the surface of so-called multi-media continues in the form of stories (even in computer games, though in fragmented ways). Media-archaeological analysis, on the contrary, does not operate on the multi-media level. Taking account of the fact that all so-called multi-media is radically binary values, digital data processing is undermining the separation into the visual or auditive or textual or graphical channel which on the surface (interface) translated data to human senses. Therefore an archaeology of operative media is not looking for the metaphorical discursive impact of technologies, but reconstructs the generative matrix created by such dispositives. Kircher's term for his machine to automatically compose music is not by coincidence called *arca*, which is the old name for "archive". In Foucault's updated sense, *l'archive* for Kircher is the generative set of rules which algorithmically produce the music like nowadays programming with software libraries such as SuperCollider.

Instead of asking for cultural memory and the archive on the surface level in discourse, the question of the generative, Foucauldean *l'archive* behind cultural production arises. Media archaeology, different from Cultural Studies, concentrates on the material genealogy of apparatuses which are imbedded within "the archive" as condition of techno-logical knowledge, in the sense of a mathematical rereading of Foucaults *Archaeology of Knowledge* which does not only deal any more with written texts, but with numbers as well, reminding that at the very orgin of the vocalised Greek Alphabet the single letters (*stoicheia*) were used for numers as well (Pythagoras), counting in an "elementary", discrete way.

Media Archivology: Albert Kahn's Archives de la Planète

Albert Kahn's Archives de la Planète, a collection of early colour photography and documentary film, assembled between 1909 and 1932, insists in many ways, and resists being reduced to historicism. It is still located at their original place in Paris, and appeals to cultural historians and media archaeologists in different ways. The very name of *les archives* de la Planète reminds of a record memory in the institutional sense (expressed, in French, mostly in the plural). Its items therefore deserve all the skills of archival care, and invite for research which first of all goes back to the archives themselves. *Les archives*, though, is not to be confused with Michel Foucault's more fundamental notion of *l'archive* in the singular, defined in his *Archéologie de Savoir* as the system which governs discursive enunciations as such. The media "archivological" attention, in its material turn, is therefore on the very technical conditions which render such a visual cosmopolitan memory possible at all: the film roll, and autochrome photography. The records in Kahn's *Archives* have a double existence: On the one side its symbolic order, the corpus of textual, alphabetically coded documents, which elicits historical research and contextualization in its widest sense. On the other hand, there is its material embodiment, which attracts the media-archaeological focus.

Since the invention of the photography, continuing with phonography and cinematography, analog recording media have built up a signal-based memory of sound and images, which so far have escaped historiography as a form of symbol-based textual notation. Boleslaz Matuszewski, in 1898, already declared cinematography as "a new source for history". The phonographic equivalent of Kahn's photo- and cinematographic project have been the Archives de la Parole, founded by the linguist Ferdinand Brunot in 1911 at Sorbonne University, Paris. A collection of gramophone records or autochrome photographies is a "counter-archive" (Paula Amad) of cultural memory in a media-archaeological sense, since it preserves the signals not only for human

perception, but for nonhuman readings as well, by analytic software and future machines, to reveal layers of cultural memory which we do not even know yet.

While the historical documents refer to the past, the autochromes (for every visitor who has ever observed them) can never be reduced to a distant object, but emanate a material presence - a presence, which is transformed once it is translated into the Kahn museums's Fakir online data bank. While Les Archives are an inexhaustable source of early twentieth century ethnographic and intellectual visions of planetary culture, they are still no museal anachronism, but realign to the visual encyclopedia, to the *musée imaginaire* of the globalised Internet community, whose computing machines and data server farms actually update Kahn's impetus repeatedly.

What looks like a curious museum singularity at Boulogne-Billancourt in Paris at first glance, is in fact symptomatic of the ways technical recording media have transformed the cultural memory mechanism since 1900. This resulted in new kinds of analysis which went far beyond the conventional notion of cultural heritage, such as the *Encyclopaedia cinematographica* created by the Göttingen Institute for Scientific Film (since 1952), initiated by Konrad Lorenz to create a collection of two minute sequences ("preparations") of movements from animals, humans, and machines, from around the world, on celluloid.

Kahn's collection, in accordance with Henri Bergson's philosophical mind, seeks to preserve the *élan vital* of local cultures around the globe, for which the media specific, presence-generating aesthetics of colour autochromes and film, capturing movement, looks like the perfect technical affordance. What is preserved in such recordings, though, is not live, but ghosts.

With all respect for its heroic philanthropic effort, there remains not only a melancholic overtone (which accompanies all media archaeology), but an uncanny ambivalence of *Les Archives*. The "new media" of communication and technical recording served Kahn's cosmopolitan cause in an uncanny way. From its beginnings shortly after 1900, Kahn's global initiative of audiovisual documentation took place *sub specie oblivionis*. Kahn's and his collection director Brunhes' enterprise has been a symbolical exchange of media archival memory against the threat of imminent extinction of local cultures and natural environment, as a result of the very act of industrial modernization of which the applied recording technologies have been part themselves. Is was still Western technology and sciences which objectified cultural otherness, by its textual and media techniques or recording, taxonomy, and control.

The almost techno-traumatic ambivalence of the cosmopolitan and ethnographical ethics in Kahn's *Archives* result from the anticipatory

"future in the past" bias of the recordings. Documentary storage, here, has been driven by a virtual sentiment of possible extinction, just like the monumental ethnomusical recording projects of the Phonogram Archives in Vienna and Berlin since 1900 were driven by the impulse to counter-balance the future modernization of existent global sound cultures by technical audio-signal registration. In contemporary Germany, Albrecht Meydenbauer's initiative of a photogrammetric archive of endangered historical architecture became justified by subsequent World War II bomb destructions indeed.

If Kahn's Archives have been driven by the impulse to symbolically undo the imminent finality of local cultures around the globe, this time figure is certainly true for the entropy of their storage media themselves. Their recent digitization has been an effort to undo this relentless temporal arrow, but might be subject to a different kind of obsolescence itself soon.[18] The autochromes in Kahn's Archives miraculously still endure, in all its fragile chemistry and glass materiality. With the digitization of such physical signals to abstract data to ensure their migration for long-term preservation, the glass now concretely returns within the micro-technical archive, in the silicon microchips. As once pointed out by historian Michel de Certeau, it will required a new kind of archivist to research such planetarean *Archives*.

ARCHIVES OF MOTION VS. ARCHIVES IN MOTION

Terminologies of the "archive"

Kinetic phenomena have not been subject of archivization in the traditional sense of its alphabetic regime of administrative textual records. But with techical recording media, a dynamization of "the archive" itself takes place with time-based and data-processing media (the algorithmization / rhythmics of the digital archive). Next to the archive *of* motion, the storage of audiovisual and textual recordings of dance, the archive as a concept itself gets *in* motion. This requires to differentiate between "memory", "storage" and "archive", between "analog" and "digital" recording of movement, between performative "re-enactment" and archival record.

Storage unequals archive

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18 As it is appropriately discussed by Trond Lundemo, Digital Returns: The Archives of the Planet and the "Rhythm of Life", in: Trond Erik Bjorli / Kjetil Ansgar Jakobsen (eds.), The Cosmopolitics of the Camera. Albert Kahn's Archives de la Planète, Bristol (Intellect) 2020, chapter 12

"The development of electronic computers has merely provided precise terms and circuit diagrams for factors which come into play in all cases of archivizing."[19] But here, a decisive escalation comes into focus. The function of the archive proper is the orderly documentation of conditions in the production of events (administration, economical data, contexts) which is the logistical "paratext", traditionally fixed on paper or in textual electronic files. Against this function, technological storage is a different, radically time-critical regime of keeping records from the past in latency for re-enactment in the present, oscillating between recording and erasure in high frequency. At the very basic level, all computational media, when operating with "adding" numbers (in the logical gates), like in mathematics by humans on paper, always requires to write and store numbers for a short-time moment, then erase and overwrite it - starting from Al-Chwaritzmi's "algorithm" written in sand, and culminating in the turingmachine tape.[20]

Notation of dance and kinematography

Only quite recently in the course of long-term history dance as cultural form could be dynamically registered by storage media: cinematography first, then videography, and thus became reproducable as movement. Different from symbolical dance notation which leads to the re-generating of movement sequences always individually, audiovisual recording is cultural engineering in a specific way, being able to register artistic expression like music and dance in high temporal fidelity to the unique event, thus suspending it from history in favour of re-presencing. When watching a video from the archive, even though cognition knows about the historicity of the performance, human senses cannot but treat it like a present event. This is liveness by kinetics which no graphical notation can ever approximate.[21]

At that point, recording media change from passive to active archival functions, from pure storage to genuine re-play. But more than this, audiovisual recording leads to artistic forms *sui generis*, from reproductive *mimesis* to technologically induced *poiesis*. This technological *apriori*, in the case of dance, leads to performance which is not just recorded by the camera, but produced for the camera eye only (post-production inclusive), different from the gaze of the human

19 Friedrich Kittler, Forgetting, in: Discourse 3 (1981), 88-121 (93); GO: idem, Vergessen, in: Texthermeneutik: Aktualität, Geschichte, Kritik, ed. Ulrich Nassen (Paderborn) Ferdinand Schöningh) 1979, 195-221
20 See Diego Gómez-Venegas, Forgetting / Cybernetics, forthcoming in: CAC issue no. 1 (2019) "Resurrecting Cybernetics", http://www.chronusartcenter.org/en/caceditorial_01
21 Dietrich Schüller, Von der Bewahrung des Trägers zur Bewahrung des Inhalts, in: Medium no. 4 (1994), thematic issue: *Archive - Medien als Gedächtnis*, 28-32 (28)

spectator in the traditional auditorium or theatre, and has resulted in the sub-genre of "screendance" (*alias* "videodance", "cinedance") which edits time (artful movement) itself, free from the restrictions of physical gravity and duration.[22]

As long as scores (like in the time of the Baroque) referred to rigid form of dance governed by fixed sequences of gestures and steps, symbolical notation could indeed fix that algorithm of movement. But with the dynamisation (if not to say liberalisation) of dance since late 18th century as part of a quite revolutionary acceleration of change in society, dance required a more flexible form of notation for individual artistic expression, from sequenced patterns to individual expression varying with each new perfomance - a variety which only cinematography could finally document.

Retro-digitalisation of cinematographically or videographically documented performance art for the sake of preservation makes it more volatile than ever. Long-term preservation of such data still requires the stability (thus immobility) of an institutional frame called "the archive"; but in its technological essence, this archive gets in motion more than ever: Text files and audiovisual formats, once dissolved from physical inscription (like phonography) and informationally bodyless, need to be converted and copied to new carrier technologies again and again - in "permanent migration"[23]. This necessity, at the same time, opens new options of "reading" the records. While kinematography cuts down movement in single photograpic moments (frames), digital registration analyzes moving images down to sub-iconic elements and makes every pixel mathematically adressable. All of the sudden, moving images and the knowledge of dance can be linked on the elementary level and calculated down to the last pixel. Thus the digitalisation of dance archives, with "movement" being subject and object of such archives, has a *paradigmatic* position for the discussion and aestehtics of memory in the age of technomathematical media.

Alphabetisation of movement: cinematography

Even if all the media power of the cinematic apparatus stems from deceiving human perception to create the impression of continuous movement, cinematography – in spite its „graphic" name - is not steady signal-writing at all, no (kymo-)graphical recording of time-varying continuous signals in the sense *methode graphique*, but a discrete

22 An argument in the lecture "Screen-Dance/From Stage to Film and Back" by Claudia Kappenberg at the International Symposium ARCHIVE/PRACTICE in Leipzig and Dresden-Hellerau, December 10th-13th, 2009
23 Andreas Kellerhals-Maeder, Archive in der schönen, neuen Welt. Auf dem Weg zu einer klärenden Position, in: Geschichte & Informatik, 12 (2001), 89-87 (91)

sequence of photographic stills. This is why Marshall McLuhan still subsumes cinematography under the „mechanic" Gutenberg age. Images recorded on celluloid are technically configurated like alphabetic strings of characters in printing - with different transition probabilites, though.

"Really" archiving movement

Widening the horizon leads to archival research into the epistemological implications of artful movement such as the early biometrical and ergometric recordings of human gestures by Marey in Paris or by Gastev in Moskov. This brings us back to the ancient Greek notion of *mousiké* which encompassed sound as well as dance and other phenomena of articulation in time.

Music is artful organisation of sound in time, such as dance is the temporal organisation of forms and bodies in space. Drama always meant the revealing of structures of time streams.[24] In the age of *streaming media* such cultural performances get an additional, tecnical meaning. The protagonist in this media theatre is a decent letter: "*t*", the symbol for the parameter of the physical time axis. After all, every performance art refers to *chronotechnologies*, understood here in the sense of the ancient Greek musicologist Aristoxenos who defined *chronoi* as the smallest units of rhythmical time (long, short, intervals). His definition referred to poetic prosody and dance especially, but counts in a more general sense as well.[25] In the age of algorithm-driven computing, such a notion can be extended to the rhythms of digital data processing.[26]

The subject of archiving movement extends to the dynamisation of the archive. The essential operation to create an archive of moving arts like dance, of course, is recording: either symbolically (by dance notation in the tradition of writing / *graphé*), or by media endowed with the capacity to register the physically real audiovisual signals (media-archaeologically starting with the phonograph and with chrono-photography), thus literally engraving ("groove") - in respect to Aristotle's correlation of time-number-movement - the over-countable event. Countable movement, which at first sight reads like an oxymoron, can be analyzed only by use of real numbers which can not fully be catched by symbolical notation

24 Hans-Thies Lehmann, Postdramatisches Theater, Frankfurt/M. (Verl. d. Autoren) 1999, 61

25 Lionel Pearson, introduction to: Aristoxenus, Elementa Rhythmica. The Fragment of Book II and the Additional Evidence for Aristoxenian Rhythmic Theory, Oxford (Clarendon Press) 1990, xxxiv

26 Shintaro Miyazaki, Das Algorhythmische. Microsounds an der Schwelle zwischen Klang und Rhythmus, in: Axel Volmar (ed.), Zeitkritische Medien, Berlin (Kulturverlag Kadmos) 2009, 383-396

but only take place in correspinding signal-based media. Only analog media like the phonograph allow for an archivisation of the essential of movement, i. e. its dynamics, and electromagnetic storage media like the magnetophon and video tape are especially capable to catch that *momentum* since their reproduction mechanism is irreducibly dynamic itself, being a function of one and only real variable: the time axis.[27] Once dance is not only graphically, but technographically recorded, its dynamic re-play challenges the classificatory order ot the archive itself, to be replaced by probabilities which is the field of stochastics. Only by means of a complete mathematical *analysis* of recordings of artful movement (in terms of real numbers) its archive can become a *dynarchive* which is reconfigurable in order to reveal new insights without destroying the recorded event itself. Cumulative memory is one thing; adaptive (algorithmic) storage another.[28]

Digitization and hypertextualization

Digitalisation in its precise sense is a techno-mathematical practice of analog-to-digital conversion by sampling. Once data are digitally stored, they can be made accessible in networks such like the World Wide Web. But not only do dance archives need to go *online*; networking means as well to create epistemological connections. This implies that dance in archives is not just connected to other dance archives, but to archives of other forms of movement as well, such as the *Encyclopedia Cinematographica* at the Institute for Scientific Film in Göttingen. Since 1952, this project has generated an archival matrix of elementary 2-minute film records of whatever moves, from human (most ethnic) dance over "animal locomotion" (to take an expression of Muybridge) to movements in material metal.

Another opening link from a dance archive to archives of movements leads directly into the laboratory. Norbert Wiener, author of *Cybernetics* (1948), was one of those mathematicians for whom contact with actual phenomena in physics, engineering, or biology would sometimes play a fruitful role in protecting his mathematics from becoming empty and artificial."[29] The place where mathematics and physics actually meet is technical media, and it happens musically. Wiener preferred in his research this middle ground, and "it is in this way that the phenomenon

27 See Friedrich Kittler, Die Welt des Symbolischen - eine Welt der Maschine, in: idem, Draculas Vermächtnis. Technische Schriften, Leipzig (Reclam) 1991, 58-80 (68)
28 See Heinz von Foerster, Gedächtnis ohne Aufzeichnung, in: same author, Sicht und Einsicht. Versuche zu einer operativen Erkenntnistheorie, Braunschweig / Wiesbaden (Vieweg) 1985, 135
29 Steve J. Heims, John von Neumann and Norbert Wiener. From Mathematics to the Technologies of Life and Death, Cambridge, Mass. / London (The MIT Press) 1980, 68

of Brownian motion focused his mathematics" (ibid.), and any scientific recording of such a motion looks like an avant-garde dance proper.

Re-enactment and the archive

When watching audiovisual recordings from a dance archive, a disruption takes place: between the technology of recording which is measuring, belong to mathematical, physical time (Henri Bergson calls this *temps espace*), and the phenomenological experience of time (Bergson's *temps durée*).[30]

This brings research close to the question of artistic practices of reconstruction, of re-enactments and of (self-)archivisation. For the re-exposition of historic media art, the crucial question has raisen: Does this require the original *versus* functionally equivalent technological hardware? Do the same criteria count as well for re-enacting art based on human bodies (as in the case of dance)?

There lies a world of difference between technology-based and body-based re-call of the past. The difference is between real signal recording and symbolic order: between the video recording (on magnetic tape) of a dance which can thus be identically reproduced in its "punctual" (Roland Barthes) singularity as temporal event at any later point in time, and the re-enactment of such a piece on the basis of a score in symbolic or graphical notation which demands ever new interpretation and allows for improvisation (the un-notated). In the case of Samuel Beckett's play *Krapp's Last Tape* (1958) where the human protagonist, on occasion of his birthday, listens to the tape-recorded diary spoken in previous years, the gap widens between his former and his present voice - different from his hand-written records in the invenotry to this tapes. The act of reading leads to cognitive neuro-calculation, while the acoustic channel performs physiological signal processing.[31]

There has been almost no option to catch the authentic visual of sonic gesture before the age of technical recording media, the phonograph, the Welte-Mignon recording piano, and cinematography. The historical performance practice (for dance, theatre and music) can only be reconstructed by scriptural sources, or indirectly by re-using ancient hardware (be it historical architecture, or historical music instruments).

Technical repeatability leads to almost a-historical functional re-enactment; the experience of hight-tech media time is closer to the

30 See Henri Bergson, Perception du changement, Oxford 1911, and same author, Données immédiates de la conscience, Paris 1889
31 See Carl Wiemer, Im Rauschen des Realen. "La dernière bande" - Becketts medientechnologische Antwort auf Prousts *Recherche*, in: Romanistische Zeitschrift für Literaturgeschichte 25/1-2 (2001), 169-176 (173)

criteria of experimentation in natural sciences than to the historicist idea of empathetic history. The technological reproduction of a sequence of sound or vision succeeds in exactly the same way as the original, even if it successively uses modern formats such as the Compact Disc instead of the previous vinyl record. This involves the media-archaeological question in its material sense: What difference lies between a functional electronic component of previous generations and its actual embodiment (such as the electronic vacuum tube and its functional replacement by the transistor)? In most cases, the performance is as good, exactly because techno-logics is basically operative and not performative - *gleichursprüngliches* re-enactment.

Sometimes technology itself becomes an "archaeologist" of visually recorded movements. The earliest known recording from a Television Transmission is the revue *Looking In*, performed by the Paramount Astoria Girls on the BBC Baird television system (30 lines) in April 1933, recorded by an enthusiastic amateur on his recording equipment (the Baird Phonovision system) on aluminium disc.[32] Processed and restored by digital filtering, the key to clarity seems to be movement itself. Any reproduction of one of the 30-line television broadcast as stills in a printing medium (photography in the book) gives a wrong impression of what had been actually seen. Here the time-critical comes in, since printed records (be it texts, be it images) miss a crucial element: time.

"A single frame of the Paramopunt Astoria Girls may be crudely recognisable, but when seen as a moving dynamic television image, / the girls come to life before our eyes. [...] it has much more to do with what we perceive than what is there in pixels, lines and frames. What we are experiencing is not the detail that the eye sees, but the recognition of movement that the brain sees. [...] our brain somehow builds up a model of what we are looking at."[33]

Archive, diagram and movement

From cinema studies it is well known that the filmic motif cannot be reduced to the iconology of the single frame but turns out to be a relational web which diagramatically unfolds.[34] Any archive of temporal figures is marked by such vectors.

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32 The Restored Video Recordings 1927-1935, http://www.tvdawn.com/recordng.htm
33 Donald F. McLean, Restoring Baird's Image, London (The Institution of Electrical Engineers) 2000, 211 f.
34 André Wendler / Lorenz Engell, Medienwissenschaft der Motive, in: Zeitschrift für Medienwissenschaft 1/2009, 38-49 (42), referring to: Michael Walker, Hitchcock's Motifs, Amsterdam (Amsterdam University Press) 2005, 270ff

The most decisive real physical aspect, to which only technical media like the phonograph with its recording of actual acoustic waves can refer, is temporal processuality. With such kind of recording emerges an archive of the dynamic, itself leading to a kind of *dynarchive* in mimesis to its temporal objects. The monopoly of alphabetic writing in the storage of cultural information (in fact the traditional message of the medium archive) has been broken, leading non-grapical recording and "archival" readings of signals which have never been written.[35]

Analog media allow for the memory of non-intentional records which elapse the symbolical notation by the alphabet, thus leading to what Marcel Proust (in the age of chronophotography, phonography and kinematography) has identified as *mémoire involontaire*. The recording of dance as well is part of such an audiovisual *anarchive*. But attention once more, let us not confuse *recording* and the archive. *Records* represent the content of the archive; the archive itself, though, is rather an address structure, a logistical function, closer to *logos* than to *physis*.

Media archaeology is concerned with media not only on their structural but as well on their *operative* level, thus becoming "post-structural" or "diagrammatic" defined as the "rôle intermédiaire [...] entre le geste et le symbole".[36] A generative archive: "Le diagramme n'est pas inséré dans une machine, dans un système des règles, il est un générateur" <Mazzola ibid., 154>. This diagrammatic vector of media archives places it beyond semiotics ("loin du sémotioque", as expressed by Mazzola) and closer to signal analysis, with a signal being the physical representation of a temporal event.[37]

From spatial to time-based archives

From a media-archeological point of view, the traditional archive (as indicated above) gets deconstructed by the implications of digital techniques. Since antiquity and the Renaissance, mnemotechnical storage has linked memory to space. But nowadays the static residential archive as permanent storage is being replaced by dynamic temporal storage, the time-based archive as a topological place of permanent data transfer.

Are there objects which are non-archivable, like Fluxus art in its self-estimation (though it later became subject of documentation)? Or does the electronic technology of the new archive itself provide for permanend

35 John Durham Peters, Geschichte als Kommunikationsproblem, in: Zeitschrift für Medienwissenschaft 1/2009, 81-92 (86)
36 Guerino Mazzola, La Véritè du Beau dans la Musique, Paris (Delatour France) 2007, 153
37 Karl Küpfmüller, Die Systemtheorie der elektrischen Nachrichtenübertragung, Stuttgart (Hirzel) 1974, 393

chance? The authoritative stability of the archive liquifies in the age of electronic communication; even the signature becomes digital. Electronic memory is transitory and thus comes closer to the dynamic essence of dance itself. The electronic archive transforms from a stabile data storage to a dynamic, self-organisational system of fluid data.[38] The principal storage in computers is a kind of temporary archive, a short-time memory which has been called "register". It is the essence of digital data processing that memories become more and more intermediary.

Static archival *versus* endlessly delayed memory

For any signal transducing and symbol processing systems there is the problem of limited memory capacity, both in humans and in machines. By data modelling it is easy to gather a great deal more information than can ever be represented in artificial, localized memory systems. The notion of infinite-state memory (and organizational memory) is familiar from systems theory, especially from the theory of adaptive filters. In this model, the parameters are *recursively updated* by all the received signals, whereby they can be regarded as a kind of memory for all received information. "It seems that the human memory [...] operates in this way."[39]

In institutional memory techniques, "[s]iegecraft, once the art of defending the strategic cities of European states, has become the art of defending the archive."[40] ["Die Festungen *schützen Raum* und *gewinnen Zeit* [...]."[41]] Electronic memory, though, is a radically temporalized one itself. There is a variety of dynamic short-term memories which have been developed for early electronic computing: (ultra-)sonic "delay lines" and "iconic" intermediary storage, the so-called Williams Tube, keeping pulse trains (which embody "data", bits respectively "words") in latent memory until they are used (addressed). The endless delay of the moment of ending is a chrono-rhetorical figure known in Christian theology as *katechon* (articulated by apostle Paul). Already in the world of mass media, starting with the original radio Soap Opera and culminating in television *serials*, the end-less performance, endless deferral (the *katechontic*) has become a cultural form.

[Moving the Record]

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38 Aleida Assmann, Das Archiv und die neuen Medien des kulturellen Gedächtnisses, in: Georg Stanitzek / Wilhelm Voßkamp (ed.), Schnittstelle: Medien und kulturelle Kommunikation, Cologne (DuMont) 2001, 268-281 (280)
39 Kohonen 1984: 21 f.
40 Richards 1992: 124 f.
41 E. v. H., Die Festungen in der modernen Kriegsführung, in: Im Neuen Reich, vol. 1 (1871), 53

Technically, the archive *of* motion was introduced during the late 19th Century with the urge to store ephemeral signals and phenomena for scientific analysis, culminating in the phonograph and chronophotography (finally cinematography) in the late 19th Century. The transition from an archive *of* motion to the notion of an archive *in* motion is associated with the advent of computer technologies and ultimately, the Internet, where constant transfer and updating functions redefines the temporality of the archival document itself.

The new immediacy of archival time may be compared to a situation from the area of visual recording of movement. The production and projection of documentary film since the beginnings of cinematography had been a rather heavy and slow apparatus-dependent process, and copies were expensive. Around 1968, with the arrival of the first Sony portapacs as portable video recorders (used, e. g., by Nam June Paik), "meant a breakthrough, because you could immediately play back what you had recorded."[42]

Against the Con-Temporary: Archival Resistance

Mobilizing storage into (re-)circulation belongs to the logic of late capitalist memory economy. On the contrary, a virtue of the traditional archive has been exactly that is was outside the contemporary. This *refugium*, this temporal exile, is archival resistance against complete mobility as the signature of modernist discourse. The old institutional archive served as a bedrock against the complete mobilization of records, as opposed to distributed digital archives and their open access in the Internet of today. More and more, archives find themselves both inside and outside the "Web 2.0" or "social Web" economy. A gap opens between the necessity for archival services to the public *versus* defending archival secrecy (the *arcanum*).

It is with its becoming electronically *online* that the archive is being deprived from its traditional power: its "privacy" in the literal sense (from Latin *privare*), its *secrecy* from public discourse. The former *archivum secretum* (be it in the Roman Vatican, be it in the case of the Prussian State Archives) is not just an old-aged power instrument to be overcome in favor of open access. But the contemporary archival secrecy in media culture is of a new kind, hidden within technology itself, the "protected mode" of micro-processors.[43]

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42 Tjebbe van Tijen, We no longer collect the Carrier but the Information, interviewed by Geert Lovink, in: MediaMatic 8#1 (19xx), translation: Jim Boekbinder
43 See Friedrich Kittler, Protected Mode, in: same author, Dracula's Vermächtnis. Technische Schriften, xxx

Algorithmically navigating the archives of audio-visual times past: endogenic media memory

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."[44] With so-called analog media such as the phonograph and cinematography, acoustic or optical signals 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.

Once being digitized, the electronic image or recorded acoustic signal 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.

By digital addressability, it is possible 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 is just a metaphor; for Michel Foucault, the term archaeology explicitly "does not relate analysis to a geological excavation"[45]. What is 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, if processed as

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44 Friedrich Kittler, Gramophone - Film - Typrewriter, Palo Alto, Cal. (Stanford UP) 1999, 5
45 Foucault 1972: 129

big data by "deep" machine learning in artifical neuronal nets, will allow audio-visual sequences to be systematized according to genuinely signal-parametric and *gestalt* notions (geometric rather than narrative *topoi*), revealing new insights into their informative qualities and aesthetics.

In the future, special programms for rendering data which are at present not legible may be auto-programmed by machine intelligence; so far they can be read, but not be understood - a literally media-archivological situation, re-addressing the question of information access, the ultimate „postmodern" challenge (according to Lyotard), on the electronic level.[46] In digital culture, the archival record transforms into streaming data - a new kind of dynamic archives. From an aid to cultural memory, media storage develops a knowledge according to its own logo-technical rules (*l'archive*), from within the algorithmicized data matrix.

Knowledge has become the skill where to find information about it: *infomapping*[47] - diagram rather than memory, from *storing* data to *sorting* data. *Information*, as defined by Shannon and Weaver (1949), refers to the combination of data into messages intelligible to human beings. But this understanding does no longer necessarily require a narrative shape - which is a culturally specific form of ordering knowledge in (linear) time. To know is to recognize differences, in its most radical technologica reduction to tell 0 from 1, digitally.

David Gelernter proposes the data flow of *lifestream* as a future alternative to the desktop-metaphor of present computer interfaces. The dominant mode of actual knowledge is transitional, transitory, equalling the form of the electronic current itself - a literal „liquidation" of spatial metaphors to temporal ones. Instead of emphasis on spatial memory (on hard disk) „the Lifestreams system treats your own private computer as a mere temporary holding tank for data, not as a permanent file cabinet"[48]. Future and past become just segments, functions of a floating interface differentiating data flows.

Beyond the archive?

The 21st century will increasingly become an epoch *beyond* the archive. For media memory, archival dynamics replaces archival space. Digital storage multiplies rigid taxonomies in favor of flexible selection, classification and indexing. The new archival technical approaches still

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46 "Die Öffentlichkeit müßte freien Zugang zu den Speichern und Datenbanken erhalten": Jean-François Lyotard, Das postmoderne Wissen. Ein Bericht, Wien (in: Theatrum machinarum 3/4) 1982; 2nd edition Vienna (Passagen) 1993, 192 (FO: La condition postmoderne, Paris 1993)
47 Bolz 2000: 131
48David Gelernter, Machine Beauty. Elegance and the Heart of Technology, New York (Basic Books) 1997

arrest the record and depend on immobility, for instance in the case of archiving web pages, losing the dynamic quality of its updates, reconstructions, etc., while dynamic web objects escape such freezing. Remains the difference between the archive *of* motion, the storage of moving images, sound recordings, and dynamic textual documents, within an immobile archival institution, and an archive *in* motion itself.[49]

SIGNALS AND SYMBOLS. Recording the Past Techno-Logically

Signal recording in the age of digital computation

Media-archaeological analysis oscillates between symbolic code and signal indexicality; a book title like Friedrich Kittler's *Gramophone - Film - Typewriter* addresses the relation between signal-based and symbol-based media. The age of digital textuality proudly proclaims the option of "lossless" copies (and the legal hybrid of *Originalkopie*). Symbolically coded recording beats the physial decay of its storage materialities to a large degree: "Which is why anything that ever happened ended up in libraries."[50] Foucault has been the "the last historian or first archeologist" (Kittler) in a special sense: His use of the term *l'archive* (not to be confused with the institutional archive which is always written in the plural *les archives* in French) refers to „the entropy of a post office"[51].

The early phonetic alphabet with its explicit usage of single letters for vowels to symbolically express the musicality of oral speech has been developed as a kind of *gramma-phoné* but in fact remained type-writing, i. e.: writing in discrete characters. Even if this invites to a word play, early Greek writing as a pre-phonographic recording of the spoken word, phonography is not "gramophone". Emile Berliner's name given to his variation of Edison's invention had strategic, disctinctive reasons.

Rather than symbol-writing in printing culture, a real "sense" of time (the tempo*real*) is related to signal recording since the age of the phonograph. Alphabetic writing has not simply been transformed but radically challenged by signal-based recording media like the mechanical phonograph which does not simply record the symbolic value of speech but the physical trace of the actual voice – all the difference between the elementarisation of speech by writing (Aristotle) and the recording of the sub-literal frequencies of actual *parole* (in terms of de Saussure for whom the early phonograph was a decisive tool for linguistic analysis). The ultimate return of symbolic "writing" though takes place within the alphanumerically coded computer.

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49 See Eivind Røssaak (ed.), The Archive in Motion. New Conceptions of the Archive in Contemporary Thought and New Media Practices, Oslo (Novus) 2010
50 Kittler 1999: 4 f.
51 Kittler 1999: 5

Textual and non-textual shapes of time

Symbolic (textual) writing of "historical" time differs from actual signal-based time-writing. A media science of signals from the past which opened a new field of memory research (not just as an additional source for historical inquiry). With photography, the phonograph, and electro-physiology an alternative agenda has been set. So-called Humanities (as defined by Wilhelm Dilthey) have not been concerned with the physically real - due to the limits of hermeneutics as text-oriented method, to the privileging of narrative as dominant form of representation and because of an essential lack of non-symbolic recording media. Battles have been described and interpreted, but the real noise and smell of a combat could not be transmitted until the arrival of the Edison phonograph.[52]

As lamented by Henri Bergson, the process of "spatializing time" which is a by-product of chronophotography, the mechanical clock (which Heidegger termed "vulgar time") and mathematical *analysis*, transformed the nature and experience of time as duration and flow, replacing it by the quantification (mathematization) of time into a static, spatial, divisible entity.[53] Logical electronic circuitry is text under current. In a way, only with the arrival of techno-mathematical notation systems which are numeric rather than alphabetic, true textuality takes place in the cultural engineering, resulting in time-discrete media tempor(e)alities.

The media-induced temporal affect

A "museum" technology from the past, when functionally re-enacted in the present, is suspended from history. Benjamin describes the materialist approach in almost in media-archaeological terms, in favor of a short-circuiting Now-ness („Jetztzeitigkeit") where antiquity (the *arché*) becomes co-original to the presence: "So war Robbespierre das antike Rom eine mit Jetztzeit geladene Vergangenheit, die er aus dem Kontinuum der Geschichte heraussprengte"[54] - a kind of chrono-cinematographic cut-up or *montage* indeed. "If the film called history

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52 See Bernhard Siegert, Das Leben zählt nicht. Natur- und Geisteswissenschaften bei Dilthey aus mediengschichtlicher Sicht, in: Claus Pias (ed.), Medien. Dreizehn Vorträge zur Medienkultur, Weimar 1999, 161-182 (175), referring to: Wilhelm Dilthey, Die Abgrenzung der Geisteswissenschaften. Zweite Fassung, in: same author, Gesammelte Schriften VII, 311
53 See Mary-Ann Doane, Does time become Space?, in: Liv Hausken (ed.), Thinking Media Aesthetics, London (Routledge), forthcoming
54 Walter Benjamin, Gesammelte Schriften, Frankfurt/M. (Suhrkamp) 1972-1989, vol. I, 701

rewinds itself, it turns into an endless loop."[55] The symbolic regime allows for time-reversed operations (which for the regime of alphabetic letters G. W. Leibniz once defined in his thought experiment as *Apokatastasis panton*). This concerns the level of human interaction with physical time (aka "history"). Media archaeology rather focuses on inherent media temporality - below textuality, the subliminal tempor(e)al affects induced by machines. While film philology argues in terms of image sequences, media archaeology concentrates on the single frame which just for a fractal of a moment appears to the eye and to (subliminal) consciousness. "Das wahre Bild der Vergangenheit *huscht* vorbei. Nur als Bild das auf Nimmerwiedersehen im Augenblick seiner Erkennbarkeit eben aufblitzt, ist die Vergangenheit festzuhalten."[56] At first glance this analysis seems to refer to the material film frame which at the moment of projection indeed is being arrested for a fraction of a second in order to evoke the physiological after-image in the eyes of the audience. But by naming the temporality of lightning, in fact Benjamin already implicitely describes the aesthetics of the electronic television image (just emerging at his time) - a regime of electrified *Weltbilder*. In the most literal sense Adorno during his work at the Princeton Radio Reseach Project summed up this tele-presence („live" signal transmission) under the title *Current of Music*. The temporality of the television and video images with its 64 micro-seconds per line is much too time-critical to be physiologically noticed by the human perception at all, different from the 24 frames per second for cinema which still can be detected as a subliminal massage and of what Leibniz' had termed *petites perceptions*.

Not just different histories, but different from history: signal-based tempor(e)alities

The signal-based chrono-sphere is alienated from history. Alphabetically coded documents of and on an era, made accessible by lists, card-indexes, computer catalogues, together with material kinds of reading equipment, constitute a "time machine"[57] - but only in a symbolic way. Only when signals instead of symbols become the basic operators (which is true for classical "analog" media technologies, ranging from telegraphy to radio and television), a different temporality takes place (as known from "live" transmission which is electro-physically authentic, even "indexically" true to physical time (in Thomas Levin's sense, as opposed to pre/calculated "real time" windows of presence). Signals are (electro-phyiscally called) "time signals" in most cases, with *t* as the constant parameter). As opposed to mere written or printed characters, signals take place in time itself.

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55 Kittler 1999: 4
56 Benjamin, GS, vol. I, 695
57 Tjebbe van Tijen, We no longer collect the Carrier but the Information, interviewed by Geert Lovink, in: MediaMatic 8#1, 19xx

Audio-visual media address humans at the existential level of affective sensation of being which is the temporal sense. They re-generate temporal experience by addressing the human on the sensory (aisthetical, physiological) level as radically present, while mental cognition distances it into a "historical" con*text.*

Conflicting archival tempor(e)alities: Symbolic order *versus* indexical signal

Archives as institutions are no time machines at all, while their audio-visual media records - since they demand being operated within machines - take place in time itself, as time objects different from the scriptural regime.

"Bias" as a technical term in electronic engineering describes the necessary basic electric voltage to operate a vacuum tube (esp. triode) - a pre-condioning, a ground tension for making the circuitry work at all, an electric *a priori*. [For magnetic recording, the "bias" names the pre-magnetisation of the tape by high frequency signals to improve the signal-to-noise ratio (dynamics). The proper time signal thus is pre-conditioned by a different *a priori* temporality.] In terms of Harold Innis, the archive belongs to the tools of empires which are temporally "biased"[58]; it has to be temporally charged or rather "biased" in order to become a memory base.

As long as the archival records consist of strings of symbols (i. e. alphabetic writing), a cognitive distance - in spite of the auratic qualities of handwritten manuscripts or autographs - is more or less being kept, since an act of decoding has to take place which involves the cognitive apparatus. But once photography, the first medium in its modern sense, entered the archive, the sense-affective, presence-generating power[59] of signal-based media cuts short the temporal distance in favor of mnemonic immediacy - the photographic *punctum* (Barthes), chrono-electric *choque* (Benjamin).

The negentropic effort: encoding

Once a cultural message has been translated into the symbolical code, such as a musical score from the hands of Mozart, it can be transmitted with a high degree of lossless copying. Like the genetic code, the phonetic alphabet is mostly invariant towards historical, i. e. entropical

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58 Harold Innis, The Bias of Communication, University of Toronto Press 1991
59 See Hans Ulrich Gumbrecht, Production of Presence. What Meaning Cannot Convey, Stanford University Press 2004

time. Digital data is just a special case of such alphabets. Documentary science has developed the notion of „logical preservation"[60]. But any information must take place in or on a material support which introduces another, different tempor(e)ality. Does the concept of „information" (which is measured by the binary digit) dispense with the material link? To what extend is software independent of the carrier used for transport?[61] In order to be executable, any algorithm has to take place in matter - even if this is just paper. The metonomy which takes the Floppy Disc as a material support for the software itself is a hint to the material link.

Retextualizing the sonosphere: digitized sound

There is an implicit "sound" of the temporalized archive. For the electric age Marshall McLuhan identified a „culture without writing"[62] which he calls „acoustic space". Against the immediate impression, this expression does not simply mean sound and music, but a specific form which he correlates with the electronic media sphere - the sphere of resonances. Thus a different kind of tempor(e)alty is introduced, resulting in a different *media theatre*. To conceive the operational theatre not from the optical-perspective but from the acoustic dimension opens access to the awareness of time-based and time-critical processes - the signature of high-technological media.[63]

In a variance of the notorious *incipit* of Kittler's *Gramophone* book, media determine our *temporal* situation. When coupled to technical media interfaces, humans are being placed in a different temporal "situation" than normally experienced. In alliance with Günther Stern's (alias Günther Anders) unpublished habilitation from 1930 / 31 *Philosophische Untersuchungen über die musikalische Situation* the question arises to what degree operative media („im Vollzug") perform *ekstasis* of (or: from) historical time.[64]

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60 Hans-Joergen Marker, Data Conservation at a Traditional Data Archive, in: Edward Higgs (ed.), History and Electronic Artefacts, Oxford (Clarendon Press) 1998, 294-303 (296)
61 Doron Swade, Preserving Software in an Object-Centered Culture, in: Higgs (ed.) 1998: 195-206 (195)
62 See Herbert Marshall McLuhan, Kultur ohne Schrift, in: Martin Baltes / Fritz Böhler / Rainer Höltschl / Jürgen Reuß (eds.), Medien verstehen. Der McLuhan-Reader, Mannheim 1997
63 Frank Hartmann, Instant awareness. Eine medientheoretische Exploration mit McLuhan, in: Soundcultures. Über elektronische und digitale Musik, hg.v. Marcus S. Kleiner / Achim Szepanski, Frankfurt/M. (Suhrkamp) 2003, 34-51 (35)
64 Günther Stern, Typescript *Philosophische Untersuchungen über musikalische Situationen*, State Library Vienna (LIT 237 / W13), 1930/31; now edited by Reinhard Ellensohn: Günther Anders, Musikphilosophische Schriften. Texte und Dokumente, Munich (C. H. Beck) 2017, 13-140. See Veit Erlmann,

What is called "Hörspiel" as an art form in German, the radio play, in the anglophone world is often called "radio drama"[65]. This is still oriented at the definition of drama as literary script, logocentristic (orientated at literature), as opposed to a radical different approach which is medium-centristic (radio-phonic) the acoustic-based "Schallspiel" (Friedrich Knilli)[66] which dramatizes the signal materiality of radio transmission - a genuinely media-dramatic approach.[67] McLuhan defined the (literally) „current" state of media-induced communication as "acoustic space", since the ear perceives signals simultaneously (which indeed is the implicitely sonic situation of electro-magnetic waves as well). Such signals are beeing processed in the right hemisphere of the brain, as opposed to the sequential processing of signals in the left hemisphere which has been privileged since the invention of the phonetic alphabet for processing of information. Beyond the *Gutenberg Galaxy* as described by McLuhan 1962), with "live" signal transmitting electronic analog media, non-Euclidian temporal synchronicity has emerged.[68] With contemporary realtime data processing, however, "textuality" returns in algorithmic computing more strictly than ever.

Active media archaeology (such as the opto-electronic reading of otherwise unaccessible groves from recording) retrieves past sound signals by digital sampling and quantification. Thus, was appears to the ear like the restituted sound, in fact is already the function of a mathematical matrix. The digital *close reading* of sound dissolves any signal into discrete blocks. Digitized signals resemble the tradition of music notation; they wait to be algorithmically executed. The textual regime returns in alphanumeric codes. Algorithmic archaeology is the return of textuality in the representation of the past, but this time, the text itself becomes media-active - a kind of operativity which the handwritten or printed text never knew.

Im/mediacy: towards a dynamic technology of image retrieval

It is possible, in the age of high-frequency computing, to navigate through large amounts of data below orientation at verbal language.

Reason and Resonance. A History of Modern Aurality, New York (Zone Books) 2010, 325 f.
65 See Tim Crook, Radio Drama. Theory and Practice, London / New York 1999
66 See Friedrich Knilli, Das Hörspiel. Mittel und Möglichkeiten eines totalen Schallspiels, Stuttgart (Kohlhammer) 1961, and Elke Huwiler, Sound erzählt. Ansätze einer Narratologie der akustischen Kunst, in: Harro Segeberg / Frank Schätzlein (eds.), Sound. xxx, Marburg (Schüren) 2003, 285-307
67 Klaus Schöning, Zur Archäologie der Akustischen Kunst im Radio, in: WDR (ed.), Klangreise. Studio Akustische Kunst: 155 Werke 1968-1997, Cologne 1997, 1-11
68 See Tony Schwartz, The Responsive Chord, New York (Zone) 1974

There is an im-mediate access to data patterns, unfiltered by metadata. Expressing texts, sound and images in numerical or logical values subjects all phenomena to the Turing machine. As expressed by Vilém Flusser for the "technical image", all continuous signal-systems thereby becomes divisible into discrete units which can be transmitted and reproduced as code.[69] But what is an image in computable space: a set of data, a format, an „epistemological thing" (Jörg Rheinberger)? From the media-archaeological point of view, such an "image" is just a visualisation of what been translated into a two-dimensional mathematical matrix (just like the sound from a CD player is nothing but a sonification of a serial array of binary data, that is: square-shaped signals).

[Inbetween the textual record preserved in the institutional archive and its digital counterpart, there has been the age (a real media-archaeological *epoché*) of signal recording in analog media, a memory of records of a different kind (like the photographic image or the phonographic sound, magnetic tape and video), addressing and re-enacting cultural time by physically real, indexical traces of the past.]

Still, this symbolisation in form of bits, while being an abstraction from the real world, does not mean that the relation between the information and the physical world has become purely arbitrary. When analog signals from the physical world are being sampled (i. e. time- and value-discretely quantized), the resulting strings of bits ("words") as still quasi-indexically shaped by the original physical event which, in the case of digital visual recording of dance, is the moving bodies.

At what moment is such a set of data interpreted as a cultural image? By the agency of human perception only, by verbal description (*ekphrasis*), or independent from human awareness already? Without human interpretation of certain visual patterns, the image would just be a cluster of data. Optical signals become information in the eye of the human beholder only, while the computer can deal with the symbolical analysis of such data without the imaginary.

What digital space allows for instead is the option of navigating images in their own medium - without changing the channel from visual to verbal language. In digital space, the task of *searching images* does not only mean searching for images, but has a second, reverse meaning as well: movement sequences can be automatically matched to similar movements, without the interception of words. This is dynamic navigation in *Dataland* (as designed in 1973 by William Donelson), not in the alphabet or in dance notation. Different from printed letters in a book, the symbols in digital dataland are arranged and distributed

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69 See Vilém Flusser, Für eine Philosophie der Fotographie, Göttingen (European Photography) 1984

algorithmically - a dynamics which matches the kinetic nature of orderly movement itself.

One moving image sequences have been digitized and subjected to compression for economic storage and transmission (such as the MPEG or MP3 standard), for humans it is not possible any more to interface to movement for analytic use. Visual knowledge does not arise from meta-dating only, but from within the visual endo-data: entering movement immersively. As observed from the computer, kinetic information generates a kind of second-order visual knowledge, cartography, diagrams - infomapping. A critique of the notion of „meta-data" draws on the assumption that there is knowledge already within the images, a kind of knowledge which either does not need to be meta-dated or can not even be grasped by verbal description at all - *endo-data*. Let movement be informative itself - by means of operating with values that are, already, intrinsic to the recorded movement. Such insights can be teased out once the operative unit is subjected to algorithmic data processing.

Any „digital image" is an image no more in its emphatic cultural, phenomenal sense; what looks like images to humans, for the computer is rather a function of mathematical data sets. The media-archaeological hypothesis reads like this: There is a knowledge already implicit, „dormant" within the electronic images, which - independent from external descriptions (metadata) - waits to be un-covered from within. Digital data banks of moving images, when cleverly adressed, render a kind of knowledge which would otherwise be unimaginable. Digital images render aspects of visual knowledge which only the *medium knows*, virtually in the „unconscious" of the data-bank. Different from media phenomenology which is still oriented at human perception, the media-archaeological program is to uncover inherent *virtual visual knowledge*.

Navigating digitized cultural items is possible by means of their numerical addressability, independent of verbal meta-dating. Most video extraction in archives of moving images is not based on the single frames (like in post-production editing tools like AVID) or even picture elements, but on whole image sequences. The computerization of such media archives now promises to decipher them as algorithmicised data sets, as clusters of pixels and colour values, edges, curves, sonic timbres. Strings of textual symbols, images and sounds have become calculable and thus capable of being exposed to pattern-recognition algorithms. Such procedures will not only media-archaeologically "excavate" but as well *generate* unexpected 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. Contrary to traditional semantic, musicological or iconological research in the history of ideas, such an endogenic visual archive will no longer list images and sequences according to their authors, subject, and time and

space of recording. Instead, digital image data banks will allow visual sequences to be systematized according to mathematical rather than narrative *topoi*, revealing new insights into their informational values.

Even if algorithmic search operations in computing have not been capable, so far, to identify sophisticated forms of visual rhetoric (at least: the whole of an object from the sight of a part of it), with the "deep learning" concept of recursive "big data" processing, the computer has been trained to spot associations between seemingly unrelated pieces of information and derive generalizations on the basis of new protocols.[70]

ARCHIVAL RESEARCH IN TIMES OF "DIGITAL HUMANITIES"

Good-bye, "archive" - towards dynamic data retrieval

From the digitization of vast amounts of records - mostly by necessity, for signal preservation against progressive material obsolescence - arises a creative chance which is progressively performed in Digital Humanities. The application of creative algorithms to experiment with new forms of navigating enormous amounts of archival signals and data from within (be it textual or audio-visual), result in new insights by mathematical intelligence like stochastic analysis, similarity-based retrieval and Shannon entropy as measure of informational content in records.

[In nineteenth century, the notion of physical entropy co-originated with "social statistics": Quetelet's *homme moyen*. And in Tarde's social statistics, information theory and sociology, for once, converged in the concept of stochastic probabilities: the statitistian, like the archeologist, „jette sur les faits humains un regard tout abstrait et impersonnel“[71] - which in present Digital Humanities replaces sociology by "social analytics" (Lev Manovich).]

[So-called "predictive analytics", both in high-frequency financial trading and the surveillance by agencies like the NSA, does not accumulate data from a long past any more but collect present data to predict immediate future profiles - thereby historicizing the present already (as "future in the past"), resulting in new forms of time manipulation - true chronopoetics.]

(Mis-)Understanding the "archive": big textual data and the distant symbol-processing gaze (Moretti's *distant Reading*)

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70 See Duncan Davies, Diana Bathurst u. Robin Bathurst, The Telling Image. The Changing Balance between Pictures and Words in a Technological Age, Oxford (Clandendon) 1990, 64 f.
71 Gabriel Tarde, Les lois de l´imitation, Paris 1890, chap. IV (Qu´est-ce que l´histoire?), sub-chapter „L´Archéologie et la Statistique“, 114

"[T]o see through computer 'eyes'"[72] is "a powerful mechanism of defamiliarisation [...] - a device for seeing what we could have not noticed previously" (ibid.), juste as the technical scanning of a historic image suspends it from its radical dependence of the cultural, iconological context.

["The computational allows us to perform what literary scholar Franco Moretti has termed 'distant reading' – a practice that moves away from the close, hermeneutical reading of texts in favor of an algorithmic approach that presents overarching structures and patterns. For Moretti, distance is a precondition of knowledge by its focus on units that are larger than the singular text[73], recalling philosopher Friedrich Nietzsche's "passion for distance". Such non-hermeneutic optics is an option to extract a different kind of knowledge. According to Moretti, one can not study a large archive in the same way one studies a single text. Individual texts have been written to "speak" to the reader, and so, provided s/he knows how to read them hermeneutically, they always end up making some sense; "*but archives are not messages that were meant to address us*, and so they say absolutely nothing until one asks the right question"[74]. There is a fundamental difference between Shannon's mathematical theory of communication as intentional channel-coding, and the administrative archive as depository of legal claims; such archives are (mis-)read by historians as if provided with an intended message from the past to the present, to be transformed into a narrative by historiography. "Archives are not messages that were meant to address us, and yet meaningful information can be extracted from them. This is an exciting idea when the archive is the entirety of literary history, a chilling one when it's our private internet activity or phone records."[75]]

The challenge of "quantitative formalism" is not only the new objective information derived from calculation, "but rather what that counting reveals" (ibid.).

For librarians, classification by metadata is essential in data retrieval. But since media archivists have started digitizing and processing media such as film and sound recordings, the classification component of such projects has transformed from external to internal, to information retrieval from *within* the digitized records. Signal processing in media culture creates a new kind of algorithmic archive. Familiar cultural

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72 Manovich 2012: 276
73 See Franco Moretti, Conjectures on World Literature, in: New Left Review (January / February 2000), 54-68 (57)
74 Kathleen Fitzpatrick, The Ends of Big Data, in: Los Angeles Review of Books, June 27th, 2013, on Franco Moretti's collection of previous essays *Distant Reading*; http://lareviewofbooks.org/article.php?type=&id=1801&fulltext=1&media=#article-text-cutpoint
75 Fitzpatrick 2013

analysis is increasingly replaced by big data cultural *analytics*. There are new options of information retrieval, based on the physical signal qualities themselves, not limited any more to its logocentristic subjection to metadata.

"Forensic" media archaeology of the digital "archive" (the storage architectural element ROM)

Analytic media *archivology* refers to the archive of computing itself - *l'archive* in Foucault's sense, not the institution for record memory which in French would always be expressed in the plural: *les archives*. *L'archive* of media is the material and logical conditions of possibility for any kind of technical articulation. Methodologically, the approach *from within* technology expresses the media-archaeological, that is: non-human point of view, distant from the cognitive or bodily perception of "media" which humans experience from interfaces like the computer screen. For such an investigation, media archaeology necessarily departs from the familiar historical research. Radical media archaeology is not simply another variance of historiography but an alternative way of dealing with temporal evidence resulting from times past *in the present*.

Media philology escalates when computational analysis is not only applied to external signals, but to computers themselves. One specific media-archaeological (or -archival) target is to restore the program code that is stored in a masked Read Only Memory (ROM) chip. In order to extract code from an obsolete Read Only Memory within a micro processor, it requires both physical analysis and software to extract the bits. If the chip itself is using a known architecture and assembly language, reverse engineering can be applied to recover the actual instructions stored in the ROM. By electro-physical signal analysis, "data" become clearly discernible.

If the unknown bits are put through a disassembler, that is, reconverted from machine language into mnemonic code, they may make code "sense" again, restauring them for human hermeneutics. Media philology and its twin, media archaeology, is both hardware and software analysis. While software hacking can be destructive on the symbolical level, tinkering with circuits that are directly connected to mains electricity can be dangerous in a bodily sense.

[Contrary to the current claim for keeping the archive "open", for "instant" and "open access", there are arguments for preserving temporally sheltered records ("Sperrfrist") in *online archives* - even in terms of computational science where there is the "protected mode" for embedded code.]

The material de-construction of computer chips is driven by material criticism which is much neglected in DH, by operations such as resetting a fuse to allow reading/writing of protected areas or probing a data track to observe data being processed by the chip, "or even trying to figure out the actual logic of a proprietary chip by viewing and reverse engineering it's construction"[76].

The archive and the question of "open access"

In the up-rising Digital Humanities laboratories, experimental algorithms for processing "big data"[77] replace the static classification of the traditional library catalogue. Statistical probabilities replace particular knowledge according to information theory, and pattern recognition replaces alphabetical identification), as dynamic articulation of *implicit* record-knowledge.

Archives in times of "digital humanities" can not be reduced to the question of "open access" to "big data". Jean-François Lyotard once formulated the political challenge of *La condition postmodene* (1979): *who* gets access to data banks. In times of DH, this transforms into the question of *how* to access technological archives. All of the sudden, the *archivium secretum* becomes attractive again.

[The question of "open access" does not only refer to big data banks but has a material aspect: the shrinking intervals of obsolescence in both hard- and software generations which become incompatible. "Access" of cultural heritage remaining from the digital age becomes a radical media-archival challenge.

With(in) the computational *l'archive* (in Foucault's sense), the familiar historicist order of cultural time, the chronological sequence, "as the emptiest of all kinds or order in which stored things are to be put, could be replaced by an order of co-presence once their combinatory connections were located."[78] Such operations in computational space are epistemologically productive since they do not destroy the material integrity of the existing record. "Digital archiving could break up the alliance that the institutional archives have maintainted with historiography and historicism since 1800."[79]]

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76 Fun with Masked ROMs - Atmel MARC4,
http://adamsblog.aperturelabs.com/2013/01/fun-with-masked-roms.html;
accessed 10th July, 2014
77 See Joanna Drucker, SpecLab. Digital Aesthetics and Projects in Speculative Computing, Chicago / London (University of Chicago Press) 2009
78 Friedrich Kittler, Museums on the Digital Frontier, in: Thomas Keenan (ed.), The End(s) of the Museum, Barcelona (Fondació Antoni Tápies) 1996, 67-80 (75)
79 Kittler 1996: 75

A radical media archivology results from experimenting with "digitally born" archives. Within the computational context of Digital Humanities, criteria borrowed from communication engineering like informational entropy make more sense than out-dated hierarchies of knowledge classification.

Algorithmic chances and katechontic criticism of 'open access' from the perspective of data- storage theory and media archaeology

A media-archaeology of knowledge is not simply devoted to the effective structuring of databases during the digital cataloguing of a given collection, nor to the design of cultural memory institutions' online web portals as the pitching of such collections in the market fair of the World Wide Web ("Europeana"). Instead, it is directed towards an epistemologically deeper
level and, for this reason, concentrates on a few very fundamental observations about the relationship between cultural institutions and digital storage systems.

Algorithmic options of 'open access' aim at that level of the digital world where digitised information is really – that is, operatively – negotiated: at the operating and programming level of the computer. Here data are no longer organised in terms of rigid classifications, but in terms of algorithms, that is, handled in a step-by-step and problem-oriented manner. Entirely new forms of accessing digitised cultural objects thus open up in the areas of text, image and sound. Aside from the question of how cultural institutions present themselves on the surface, that is, on the monitors of the Internet, laboratories might be set up for the experimentalisation of digitised cultural information, since that is what 'cultural information science' means, regarding the arrangement and comprehension of data.

The katechontique critique of 'open access' makes use of a proud term: *Katechon* means delay in the sense of a distance – just as much material as it is spatial and temporal. There are good reasons for deliberate suspense or restraining from immediate entry and access to archives, museological collections and cultural landscapes.

The storage-theoretical and media-archaeological perspective focuses on the difference of socio-cultural memory when compared to the materiality and technology of storage devices, and the deliberately distanced, momentarily directly 'cultureless' but knowledge-inspiring cataloguing of such material.

LOCATING THE TECHNO-ARCHIVE

Not to be confused: "archive" and "memory"

The "archive" of the present digital memory condition can only be identified when abstaining from the semantic seductions of its terminology. Therefore, the "archive" as administrative records office is differentiated from Foucault's specific definition of *l'archive*, understood as technological infrastructures.

Even the archive as traditional administrative agency has never been installed for cultural memory purposes, but has rather been a functional depository for legal claims. The traditional state archive has been function of well-regulated rules of transformation, passing records from administration into long term residence according to provenance. Between the long-term archive and the administrative present, the so-called registry is in force as an echo memory of the extended administrative present.

The institutional archive is a well-defined format of symbolic order, where the metadata are non-invasive to its textual records. The "protected mode" of such a read-only state memory is of a different nature in media culture. The data which are stored in (or *as*) storage cells, in a loosely coupled so-called computer "memory" unit, share with the institutional archive that the "records" can be accessed in nonlinear ways, by alphanumerical addresses.[80] But its regime is a rather techno-logical rule or cybernetic governance. In computational media, the archival function is not "memory" in terms of cultural semantics but a storage technology, which deserves to develop a theory of its own.

While for cultural and historical studies, the semantic categories of both the "archive" and "memory" seems indispensable, they have become a hindrance for a rigid analysis of techno-logical conditions of storage, such as delay lines for electric signals. Even if the semantic seduction persists in technical terms such as random access "Memory" (ROM) for ephemeral data maintenance, the media archaeological effort is to suspend technological media analysis from obscuring metaphors borrowed from nontechnical cultural discourse.

The established notion of the "archive" is not only reconfigured but defined anew under the impact of digital media. The technological "archive" is understood here not as cultural record content, but rather as the condition of possibility for "mediated" memory discourse at all.

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80 The archive serves as an example in Susan L. Star / James R. Griesemer, Institutional Ecology, "Translations" and Boundary Objects. Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39, in: Socia lStudies of Science, vol. 19 (1989), 387-420

A media archaeological concretisation of the Foucault's *l'archive*

As an institutional *nómos*, the "archive", is still an administrative and juridical memory of the state or other governmental corporations. In computational culture, though, a more generative, algorithmic, literally programmatic agency is at work. Its relation to the physical, time-continuous world is defined by time-discrete sampling and analog-to-digital signal conversation; thereby, the set of governing rules recedes into the code and protocol layers of computing, truly media archivologically. Michel Foucault's use of the word *archive* in the singular is not idiomatic, since in French, the institutional archive is always a *plurale tantum* "archives". *L'archive*, Foucault's singular, has a different meaning: the Kantian notion of an *a priori* condition of something to be articulated at all. In the case of the Internet, this is its transfer protocols.

The traditional, text-based archive literally consists of discrete elements, the elementary letters of the alphabet. But in the digital age, the "alphabet" is reduced to a binary code which encompasses both numbers and letters. The storage unit in the von Neumann architecture of current computing does not separate stored data and the processing rules any more, as opposed to traditional archives where the files are kept in magazins while the archival procedures are kept in inventories, ledgers and other administrative meta-documents. When both data and its procedures are located in one and the same operative field, the classical documentary difference between data and meta-data (known from libraries, where books and signatures are considered as two different data sets) implodes. "Memory" becomes immediate, inseparable from its organization.

Active Archives: Information-entropic imagery (Constant)

The research art initiative Active Archive at Bruxelles aims at an algorithmic experimentation of technically recorded memory, which is, at the same time, its de-humanisation.[81] A case study is their project *"Erkki Kurenniemi (in 2048)" (preliminary work towards) an online archive*. Finnish artist-engineer Erkki Kurenniemi, for decades, recorded his life with the then available media, but did not archive the records properly - leaving it rather open in storage, wanting for future computational intelligence to organize the data in the forthcoming year 2048. Simply stored in a digital memory device, multiple partial orders coexist in digital virtuality; such an *n*-dimensionality of possible memories is trans-archival aesthetics. In Active Archive's "data laundry" experiment, the files have no special meaning in themselves, but are viewed through the lens of an algorithm. "Whispers of data" reveal the archive *within* the

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81 See www.activearchives.org

digital images. In addition, para-textual data are provided, as they are contained in the metadata of a JPG image - such as information about the camera at the moment of the photographic shot, and the time stamp when it was taken. When a digital camera stores pictures on the internal memory card, it applies not human perception, but techno-logics. In informational aesthetics (as it has been developed by Abraham Moles, and Max Bense, in the heroic epoque of classical cybernetics), a digital "image" from computer memory, in its diagrammatic, algorithmic, trans-iconic sense, is nothing but an arbitrary composition of pixels, a statistical distribution of colour values, of contour lines, and directional vectors.[82]

Memory "order" in fluctuation: From neg-entropic (archival) memory agencies to data entropy in Markov processes

"Experimental archives" challenge the well-organized institutional archive. Digitized analog films can be transformed into a vast image bank which then, as unified data-set, can be subjected to image-based search operations such as matching of similarities, object feature detection, and statistical colour value comparison.

In digital memory, not only the archival records themselves but its archival infrastructure is subjected to an increasing speed of up-dates and re-configuration. Thereby, the traditional "time base" of the archive, which has been associated with (virtually "eternal") endurance, becomes a function of temporal change. An up-dated version of *Digital Memory and the Archive*[83] would nowadays be developed into an even more "radical" media archaeology in a strictly techno-centrically biased, media scientific context, and be modified into *Algorithmicized Memory and its Technological "l'Archive"*.

With algorithmic processing and "big data" access, digital memory becomes radically temporalized. It is rather hypertemporal than hyperspatial, based on the aesthetic of immediate feedback, recycling and refresh rather than on the ideal of locked-away storage for eternity. The aesthetics of recycling, sampling and cultural jamming is a direct function of the opening and the availability of multimedia archives. The richness of online-accessible text, sound an image repositories has resulted in cycles of re-appropriation.[84]

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82 See Geoff Cox / Nicolas Malevé / Michael Murtaugh, Archiving the Databody: Human and Nonhuman Agency in the Documents of Erkki Kurenniemi, in: Joasia Krysa / Jussi Parikka (eds.), Writing and Unwriting (Media) Art History. Erkki Kurenniemi in 2048, Cambridge, Mass. (MIT Press) 2015, 125-141
83 W. E., Digital Memory and the Archive, edited and with foreword by Jussi Parikka, Minneapolis (University of Minnesota Press) 2013
84 As declared in the abstract of the festival *Re-*.
Recycling_Sampling_Jamming. Künstlerische Strategien der Gegenwart, Berlin,

The archival order is surviving from the age of print with its alphabetic, classificatory order. In times of communication media based on information theory, "entropic" data trash will be the future ground for media-anarchaeological excavations.[85] Instead of thinking the archive in terms of classification and creating monuments for future memories, entropical thinking allows for the highest degree of disorder, which contains, in communication theory, the highest degree of (possible) information.

This state of affairs can be described as Markov process: a specific stochastic probability which, for the calculation of future developments of continual time(t)-dependend accidental values, requires just the knowledge of the present state, no further back-memory.

Real-time signal processing technologies in *online* and *streaming* media[86] result in a "priming" process that temporarily enhances the effective gain of the perceptual "present window" on the timescale of seconds. In the chrono-aesthetics of mathematical Markov processes, the probability of reporting a single data event is modulated by the presence of an immediately earlier one In probability theory and statistics, a stochastic Markov process "can be thought of as 'memoryless': [...] a process satisfies the Markov property if one can make predictions for the future of the process based solely on its present state just as well as one could knowing the process's full history. i.e., conditional on the present state of the system, its future and past are independent."[87]

Communication engineering measures "information" in terms of Shannon entropy, derived from "anarchival" stochastic transition probabilities which have been statistically pre-calculated. What has been the concept of physical Boltzmann entropy in times of "history", where the second law of thermodynamics made sense to the historicist imaginary of a time arrow, has transformed into a non-historicist ratio of data transmission where informational entropy is the degree of uncertainty of a given string of discrete signals.

Akademie der Künste, 26-28 February 2009; www.recycling-sampling-jamming.de

85 As practiced already, e. g., by the Redundant Technology Initiative (http://www.lowtech.org) and Mark Napier´s www.potatoland.org

86 See Douglas Rushkoff, Present Shock. When Everything Happens Now, New York (Penguin) 2013

87 https://en.wikipedia.org/w/index.php?title=Markov_process&oldid=712058457, referring to the entry "Markov process (mathematics)" in the Britannica Online Encyclopedia. Accessed 25 July, 2016

THE DIGITAL VIDEO ARCHIVE (and what it is not). Some thoughts on a media memory named "Paik"

"Online" conferencing: Archiving the present

This is a data flow under the name of W. E., talking from the Signal Laboratory of the Institute of Musicology and Media Science at Humboldt University, Berlin. On the subjects of "The Digital Video Archive (and what it is not"), this signal hereby contributes to the "13th Gift of Paik" conference[88] with a pre-recorded video lecture. The speaker got used to such an electronic positioning of giving "ghost lectures" into the void of a camera lense in more than one year of academic online teaching due to the pandemic lockdown of "on-site" university. So here I am, but there is no "me" here. This is a digital video recording. Such a recording is part of the conference thematic already. The recording will have been past already whenever it is received by the conference. Whatever is transmitted digitally, is "archival" already. Different from analog "live" transmission where a signal is modulated but temporally intact, A / D conversion and sound & image compression involves micro-archival operations on the computing level. Each signal, by the sample-and-hold operation, is subject to intermediary storage already, and every video frame needs short-time buffering in order to be digitally transmitted. This micro-temporal operations result in an always already delayed present. At that very moment, the audience can not even tell if this pixel configuration which cognitively appears like W. E. is "live streamed" or pre-recorded.

The draft for the present conference announces a new digital Internet platform which "will offer a free video streaming service" of Name June Paik works "to all over the world as Paik". This 13th Gift of Paik conference, as a hybrid "on-site" and "online" video conference, is itself part of the theme of "digital archive" already, reactualizing Paik's seminal synchronous satellite TV event, or "installation", *Good Morning, Mr. Orwell*" from New Year's Day, 1984.

[This audio-visual equivalent to George Orwell's dystopian literary vision of *1984* "linked WNET TV in New York and the Centre Pompidou in Paris live via satellite, as well as hooking up with broadcasters in Germany and South Korea. It aired nationwide in the US on public television."[89]]

To most viewers, though, it is no archival version which is known. An edited 30-minute version of *Good Morning, Mr. Orwell* has been on display in a number of exhibitions such as *In Memoriam: Nam June Paik* at the Museum of Modern Art. The more a truly archival preservation, and

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88 Nam June Paik Art Center, November 27, 2021
89 https://en.wikipedia.org/wiki/Good_Morning,_Mr._Orwell, accessesd September 19, 2021

diclosure, of its various authentic fragments is mandatory.

From the beginning, technical irritations in the broadcasting of *Good Morning, Mr. Orwell* reminded the audience that - below the human, artistic content - any telecommunication is a technical message of its medium specificity. "Different versions of the show were seen in the U.S. and France because the satellite connection between the two countries kept cutting out, leaving each side to improvise to fill the gaps."[90] This was already subjecting human *perception* of the present to the technical logics of signal *reception*. "At one point, a performer in New York attempted a "space yodel"; the host explained that his voice would be bounced back and forth over the satellite link to produce an echo, but no echoes were actually heard. Paik said that the technical problems only enhanced the 'live' mood" (ibid.). While the space yodel is about acoustic resonance and signal run time, this one second satellite transmission signal delay (ab-)used for artistic purpose. But this radically differs from "echoes" from the past in the digital archive.

The same signal transmission delay which failed for the "space yodel" turned productive for a sequence of choreographer Merce Cunningham dancing with satellite-delayed images of himself.

[At the same time, this reveals the cybernetic coupling of humans to machines as well. The philosophical question is whether this rather endangers, or actually reveals, the humanness as such which is related to the *lógos* from the beginning.]

[No electronic live event can be preserved as such, But the permanent recording of ephemeral electromagnetic waves should not the confused with its "archivization". The issue is storage.]

In a way, Paik's *Good Morning Mr. Orwell* anticipated the new possibilities of online conferencing. One scene, the "Cavalcade of Intellectuals", shows an online dialogue between an intellectual in Paris and an interviewer in New York which immediately falls in love. For this sequence of Paik's 1984 video opera, originally Michel Foucault was meant to have a satellite "live" TV conference with Susan Sonntag. The real scene is a parody, and any video conference, whatever its semantic topis, is no dialogue, but basically about techno*lógos*, with the medium of circuit switching being the message. "I can't see your human intimacy", one character expresses.

International speakers participate at this conference in the form of pre-recorded or "livestream" video lectures, while the round table on 27th Nov. 2021 in Korea will run with on-site speakers who will be dealing with

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90 https://en.wikipedia.org/wiki/Good_Morning,_Mr._Orwell, accessesd September 19, 2021

all the themes which international speakers have transmitted. But with all the optimism of video conferencing (which media artists like Paik would have appreciated, since he was open for every new technical affordance), from Paik's *Good Morning Mr. Orwell* video opera we learn as well that "online" conversation can only approximately be a scholarly dialogue but is a cybernetic circuit: a technical coupling, "technologue". The medium message of such a format is already the techno-logics of Zoom videoconferencing software. If this is technical comedy, or just another variance of the human-technology relation, or finally a revealing truth about the techno-logical condition as such, is another question of deep media-epistemic concern.

Archiving the technical condition

While the thematic focus of this conference is mainly on the "video common" aspect of the new platform, media-archaeological thoughts are rather about the technical and philosophical aspects of the clash between Paik's "analog" video works and the consequences of "digitizing" such materials into a essentially metamorphized digital archive.

Any media archive is more than about a human subject's idiosyncrasies, but as well about the affordances and options rendered by the technological unconscious which appeals to be discovered - like the signal delay time in satellite TV transmission, creatively (ab-)used by Cunningham's dance with his own electronic shadow, in *Good Morning, Mr. Orwell*. It is therefore mandatory to co-display the technical archive in the platform, such as a documentation of video recording electronics in the 1980s.

So let us differentiate between the institutional "historicist" archive which takes care of preservation of authentic "Paik" records on video tape, *and* the original hardware running it as the actual "archive of the present". Not in the sense of the institutional archive, but in the sense of Foucault's neographism, *l'archive* is the whole technical apparatus which is involved in online communication already - both its hardware and code, that is: the technical and logical diagram as condition for the possibility of "online" transmission at all. The meaning of the archive is deferred to the technical, such as - in the *Good Morning, Mr. Orwell* satellite TV broadcast of live and pre-recorded footage - the sequence with minimal music has composed by Philip Glass for John Sanborn's and Dean Winkler's video synthesizer piece *Act III* (originally presented at the SIGGRAPH 1983 (electronic) Art Show. Its hardware had been the Via Video Computer

Painting System[91], provided with a real time image processing system and an additional "Dimension" frame store software.[92]

"A video synthesizer is able to generate a variety of visual material without camera input through the use of internal video pattern generators", either accepting, enhancing, or even distorting live television camera imagery through purely electronic, or digitally augmented manipulations. The media archaeology of video synthesis "is tied to a 'real time performance' ethic"[93] and therefore an electro-technical equivalent to the Fluxus art aesthetics itself, as it can be perceived in the visualization of my very voice a video synthesizer in the background.

The charm of analog signal processing and its spectral digital hybrids: the Atari Video Music sound visualizer

Against the symbolic order of alphabetic or alphanumeric writing or coding, a Paik text from 1968 proposes a genuine signal analysis: "the acoustical analysis of pitch and timbre (obertone, formant) should replace the outmoded, often insulting pentatonic transcription" as an "invention of 19th century Europe"[94]. The Atari Video Music device, operating in the background of this lecture from the Signal Laboratory, has been, since 1976, such an audio signal visualizer, "interpreting"[95] an input musical waveform. "The Video Music translates the levels of musical intensity and mellowness into colors and shapes that are output to a graphical display" (ibid.). This vintage Atari C240 analog video music synthesizer is an analog / digital hybrid. "Input your audio and out comes […] 8 bit analog graphics."[96] This "digital" aesthetics is by no means a false retro-memory of the digital age. The Atari Video Music device "eschews a computer and uses custom analog circuitry that generates a video signal."[97] But the technical authenticity (or resistance) of the

91 #GVG-300 Video Switcher, Quantel DPE-5000
92 Teletronics V12 operating system ver L2.3 (written by Robert L. Lund)
93 https://en.wikipedia.org/wiki/Video_synthesizer, accessed September 27, 2021
94 Nam June Paik, Extended Education for the Paperless Society, in: Radical Software, vol. 1, no. 1 (1968), 7 f. (7), https://www.radicalsoftware.org/volume1nr1/pdf/VOLUME1NR1_art02.pdf, accessed September 30, 2021
95 https://en.wikipedia.org/wiki/Atari_Video_Music, accessed September 27, 2021
96 https://www.matrixsynth.com/2012/10/atari-video-music-c240-with-original.html, accessed October 9, 2021
97 Web site PCWorld, entry "The Atari Video Music is a trippy, psychedelic rarity from the 1970s" by Benj Edwards (January 28, 2016), https://www.pcworld.com/article/419318/this-old-tech-atari-video-music-is-a-trippy-psychedelic-rarity-from-the-mid-

analog gets lost in the merely symbolical "digital archivization" of such a media creation. "The design itself appears to be based on a custom digital IC driven by analog inputs. I'd love to take one of these apart to find out how it works [...]"[98], one user comments. Opening this archive simply requires reading the original patent, and even the user manual to Model No. C-240, under the entry "Specifications", actually lists a "Semiconductor Complement" with 5 integrated circuits. Deciphering the circuit diagram ("Schematic Layout") actually reveals such an IC with its digital "TTL" logic without any software.

A fundamental issue of the material Paik legacy is to preserve the integrity of the analog audio and video signal, the trans-scriptural "age of ELECTRONIC VIDEO RECORDING". Media-ironically, the "scriptural" regime nowadays returns *within* computing, as the regime of source code programming of such signals.

A central concern in Paik's knowledge has always been the difference between the electric and the electronic: "If revolution meant for Russians of 1920 electrification then the revolution in 1960 means electronification."[99] But beyond Paik's grave, this question has to be carried further nowadays: to the difference, or intertwining, between electronics and digitization (or algorithmization).

The textual Paik (symbolically time-stamped 1968) accentuates: "[...] even McLuhan misuses and mixes up the words "electric" and "electronic", which have as much difference as tonal and atonal [...]."[100] The text pleas "to focus the attention of the whole academic community drastically to this electronic situation" (Paik 1968: 8). With a similar rigour, the difference between media electronics (the techno*lógos* of analog music and video signal processing and recording) and its computational digitization has to be accentuated. A "digital" video commons platform which suggests an immediate access to the "analog" Paik video heritage dissimulates this media-epistemic difference.

The Foucaultean *l'archive* rather than the institutional "archive"

There are different levels of defining "the archive": in the institutional sense, and specifically for media records the technical sense. The media-archaeological reference is obviously the Foucaultean *l'archive* rather

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1970s.html, accessed October 9, 2021

98 Web site Retro Thing, entry "Atari Video Music: Psychedelic 1970s Music Visualizer" by James Grahame, https://www.retrothing.com/2007/09/atari-video-mus.html, accessed October 9, 2021

99 Paik 1968: 8

100 Paik 1968: 8, entry "ELECTRONIC / ACADEMIC COMMUNITY"

than the institutional "archive" (which in French, as *les archives*, is always expressed in the plural).

The Nam June Paik video "archive" in the NJP Center is composed of various formats "including single channel video, various versions of TV programs, works in progress, video recordings of performances, interviews, video sculptures and sources for installations, multifarious footage collected by Paik himself and so forth" (2021 conference draft). Media-materially, "all kinds of video formats are mixed, from the early video converted from films, 1 inch, 2 inch, 1/2 inch, 8mm, Super 8, laser discs, VHS, to Beta Cam SP, U-matic" - which have currently been converted to "live digital videos" (draft). Such a digitization, though, is standardizing and erasing the media-material difference. The media archaeological perspective rather proposes, parallel to the "digital" conversion of the content only, to establish a signal laboratory to discover the inherent techno*lógos* of individual video formats as an aesthetic function the technical *l'archive* in Foucault's sense: the physical medium and analog technique.

The conversion of analog video to digital video runs the risk of reducing media art to software, to the preservation of its data content, while ignoring its technical conditions of aesthetic possibilities (Kant's *a priori*). In digital transformation, the analog aesthetics of video art becomes a mere surface effect.

After the Nam June Paik Art Center has completed the first stage of digitalization in 2012, the 2nd digitalization stage intends to construct a free video streaming platform on the basis of digital files accessible on-line. This whole process is "like a dangerous rope walking between analog and digital" (draft) indeed. First of all, digitization allows for the multiplication of authorship, since instead of choosing a representative video, the many versions of "one" work can be accessed in co-original (e)quality. Another collateral damage to the analog video original is the digital insertion of captions and the assignment of meta-data which reveals that authentic video signal tempor(e)ality has become pure computational data space.

[The Camp studio for transdisciplinary media practices, in 2008, co-initiated the Public Access Digital Media Archive, an online archive of annotated video material.[101] The institutional "archive" itself is a symbolic order, with its logistics remaining external and non-invasive towards the actual records. But any technical infra-structure can be understood as a symbolic order itself, and therefore be interpreted as a new form of electro-dynamic archive.]

Analog video tapes are a storage medium which are not archival in

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101 https://Pad.ma

essence, but become archival records only by their institutional enframing (Heidegger's *Gestell*). They become part of the symbolic regime called institutional "archive" only when they are registered in an inventory and therefore supplied with externally metadata.

In accordance with the Nyquist / Shannon Sampling theorem, a digital video platform might even preserve the idiosyncrasies of the analog transmission - but only on the phenomenal, not techno-archival (internal) level.

Digital computing, as discrete state machine - is turning real continuous electro-magnetic signal flows (which remain as such) into what is compatible with the symbolic order: the digital regime. In that sense, any digitization is turning signals into "archival" records already.

Disrupting the bodily image

Although viewers of this video recording experience, at the very moment of reception, the image of a speaker, this image is archival already. Even if it was transmitted as "live stream", it is radically disembodied and non-present, a signal in latency. The Nam June Paik video archive as well is radically disembodied from Paik, so let us resist all efforts to anthropomophize them again. The organization of a digital video platform may exorcize all biographical hallucinations and rather allow for experimentation in the sense of "digital *non*-humanities" - just like a digital portrait of media theorist Friedrich Kittler can be composed of zeros and ones:

Fig.: Poster for online-lecture "Critical Code Studies: Reading code by the philosopher who said there is none, Friedrich Kittler" by Mark C. Marino (University of Southern California Dornsife)[102]

The rupture between embodied knowledge and technical recording shall not be smoothed but radicalized. If the "digital" is understood in the sense of "algorithmicized", a radical different intelligence emerges (as techno*lógos*) from data sets. But this should not be called an "archive" any more, since this leads to confusion.

What is essentially "Paik" in an online platform of his digitized video records? This raises the question of the relation techno-archival records (or published texts) maintain with their "author". As we know from philosopher Nietzsche's experience with his typewriter, co-author of any technical record is media technology itself.

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102 Digital Humanities series of German Studies (DHLunch@GS*) at University of Texas in Austin, 21 September 2021

[Still, it is the idiosyncrasies of aesthetic or knowledge production which still relate the symbolical order of alphabetic or "digital" characters to embodiments which - with their contingencies - are responsible for that unique articulations. The relation between symbolic software to embodiment in / as hard- or wetware, be it human or machine, remains a crucial one.]

Once Paik records has been"archivized", it should not be addressed in the name of Paik any more. As long as his estate is organized in relation to his biography, it is a "historical" archive. But as we know from Prussian or Vatican archives, the historical archive is no real archive. The real archive is the secret one - which, in technical terms, refers to the "protected mode"[103]. The real opening of an archive is its technical accessability.

The Paik estate raises the question: To what degree is artistic knowledge production bound to the idiosyncrasies and intellectual uniqueness of a personal live on the one hand, and to techno-logical knowledge on the other? The crucial challenge arises to de-personalize the NJP archive against the narrative allure of the author-biographical approach, as expressed in Paik's recollection that "[s]ince 1961, Joseph Buys [sic] and I have had a wonderful kind of contact. I found out at one point that he was saved by the Tartars in Russia during World War II, when his plane was shot down. The Tartars and Koreans are very close."[104]

But the human preference for a biographical focus prevents archival access from cold media-archaeological distance. At that moment, the crucial archival question arises whether the digital video platform should be organized according to provenance (with its transcendent referent named "Paik"), or according to pertinence which means grouping in thematic relevance and in de-individualized subject matters. Both are archivological options, the one being historicist (like the Prussian archival organology), the other being rather functional (the French post-revolutionary archive organization).[105]

"A young video curator in the 21st century will 'interpret' a video installation [...] from notations and photographs", Paik predicted in 1980) - and from the technical diagram, and the actual electronic apparatus. This can be applied to the Nam June Paik Art Center itself where Paik has become the object of his own claim. For a repository which holds electro-acoustic art, TV media art, analog video art, and finally new media "digital" art, "Nam June Paik's work requires a conceptual framework that

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103 Friedrich A. Kittler, Protected Mode, in: idem, The Truth of the Technological World, Redwood City (Stanford University Press) 2020, 209-218
104 Paik 1980
105 See W. E., Im Namen von Geschichte, xxx

goes beyond an art historical narrative."[106] Therefore, the NJP Reader once invited for the production of new conceptual systems beyond the anthropocentric focus, by explicitly "choosing to use Nam June Paik's initials for its title, rather than his full name)" (ibid.).[107]

Archival aesthetics, as opposed to historical narrative, is ice-cold in exorcizing any bio-hallucination from the reading of the records. In that sense, it is appropriate that the "NJP Reader" addresses "Paik" as what it is on the technical level: an array of writing symbols, be it alphabetic (textual), alpha-numerical (code), or binary (the "digital" signal).

The intended Paik video archive platform might not be subject-centered, and rather be organized according to cybernetic information aesthetics., just as the theme of a previous NJP Reader has been "Cyberneticus", and in 2012, the Nam June Paik Art Center celebrated the 80th anniversary of the artist's birth by the special exhibition Nostalgia is an Extended Feedback, and by the symposium Man-Machine Duet for Life, "all of which drew on the theme of cybernetics"[108].

[Against (techno-)archival prosopopietics]

The year 2022 will be marking the 90th anniversary of Nam June Paik's birth, as the *Gift of Nam June Paik 13* conference draft explicitly reminds us. On that occasion, the Nam June Paik Art Center will "offer to the world another gift of Nam June Paik, an on-line digital video archive" of his video works. But let us get rid of the symbolical number magic of "round" anniversaries, and replace his memory by a more recursive, nonlinear, actual "random access" (as once claimed by "Paik" himself) to storage media that occasionally recall Paik's legacy according to innertechnical, inherent techno-chrono-logics.

To launch an "archival" platform on occasion of a biographical birthday is still subject-centered. The truly media-archival sense of time is rather de-humanzing: There is no more any bodily Paik in the Paik estate, no more possible intervention from a strong character called Nam June, no ididosyncratic veto. The archive shifts his memory from the real to the symbolical, from collective memory to a collection of storage media.
As long as an archival "body" (*corpus*), which - according to archival terminology - is nothing but a well-ordered assemblage of records - is anthropocentrically (or prosopopoietically) confused with the specter of a deceased human body (*corpse*), this inevitably seduces human

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106 NJP Reader #1 out now = announcement by the Nam June Paik Art Center, from December 20, 2009. Editors: Youngchul Lee, Henk Slager
107 Compare Jacques Derrida, Le t-i-t-r-i-e-r, in: xxx
108 https://njpac-en.ggcf.kr/njp-reader-3-cyberneticus/, accessed September 26, 2021

imagination to hallucinate the individual "behind" the archival records. *Prosopopoeia*, in ancient rhetorical theory since Quintilian, is a figure of speech in which an *inanimate* object is "ascribed human characteristics or is spoken of in anthropomorphic language"[109] Against such historicist hermeneutics and prosopopoietics, media archaeological "remembrance" sets computational distancing.

"Exploring the video archive is like looking into Paik's brain, which is filled with his diverse interests and disorganized ideas" (conference draft) - and can be, in cybernetic return, modelled by artificial neural nets.

According to this conference draft, the Nam June Paik archive "expresses his aesthetics" - but there is no unifying mind any more that transcends the apparent disorder. The video works that are archived in the South Korean Nam June Paik Art Center are "a mixture of bits that seem to have nothing to do with their titles, different versions of an edition which actually look all alike, and numerous videos that retain the traces of his collaborators. This way, the video archive is directly related to Nam June Paik's video aesthetics" (conference draft) - or, in reverse, Paik's video aesthetics can itself be re-interpreted as a function of discursive and nondiscursive agencies of video technology.

[Non-Linear Memory Access]

Narrative cultural memory differs from non-discursive archival storage. Media archivology tries to get rid of the cultural symbolical number magic such as anniversaries of an artist's birth, to replace it by a rather non-linear, non-linear "random" access to Paik-memory depending on thematic occasions which can rather be non-human, technical recursions than discursive remembrance.

As it has been expressed by the Paik text "Random Access Information"[110], the linear temporality of reel-to-reel video tapes determines not only the audio or visual recording, but concerns the techniques of memory retrieval as well. Modalities of analog signal, or

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109 Wikipedia, entry "Prosopopoeia", http://en.wikipedia.org/wiki/Prosopopoeia, as quoted in: Anders Michelsen, 2011, 'Pervasive Computing and Prosopopoietic Modelling: Notes on computed function and creative action ', in: The Fibreculture Journal, vol. 19, pp. 47-71; http://nineteen.fibreculturejournal.org/fcj-131-pervasive-computing-and-prosopopoietic-modelling-%e2%80%93-notes-on-computed-function-and-creative-action, accessed September 21, 2021
110 Nam June Paik, Random Access Information originally published in: Artforum, vol. 19, no. 1 (September 1980), https://www.artforum.com/print/198007/random-access-information-37725, accessed September 16, 2021

digital data retrieval is a core archival issue indeed. In his seminal Exposition of Music - Electronic Television exhibition in 1963, *Random Access Music* has been Paik's name for a cut-up installation where strings of magnetic tape were fixed to a gallery wall whose audio recordings could be randomly "read out" by a movable magnetophone head by the visitors respectively auditors.But at that moment already, Paik has been anachronistic: random access has been actually realized in contemporary digital computing such are the "core memory" (with the "digital archive" as technological formation). At that very time, the fast addressability of digital information had been a central issue in computer memory. While this intuitive random access has been analogue both the technical and phenomenal sense, his contemporary computing culture already used magnetic drum memories for digital data storage and access. While Paik's artistic installation has been "participative" human-machine random interaction indeed, magnetic computer storage turned the same mechanism of Random Access Memory (ROM) into a "pseudo-random" matrix since it can be exactly addressed numerically. And the magnetic-core memory (providing for "random access" in technical sense) had been dominant between 1955 and 1975, allowing almost immediate, but destructive reading of magnetically polarized 0 / 1 information in a Cartesian x / y grid or magnetic cores and wires. The "random access method" had literally been developed with the IBM 1956 hard disc drive: 305 RAMAC (Random Access Method of Accounting and Control), culminating with the 1980 IBM 3380 HDD device and its internal warning "Caution: Intense Magnetic Field" - which is "Fluxus" in its most rigorous technical intensity.

In that sense, Paik's *Random Access* approach has not been in alliance, but almost opposition to the digital archive. "Archival" access to records occurs in a non-linear, non-historicist way. Paik's text from 1980 reminds: "Time-based information and random access information are differentiated by the retrieval process. The "book'' is the oldest form of random access information"[111]. Alan Turing, in his lecture on the "State of the Art", reminded of the rather lenghty access time when reading through a scroll. By directly adressing every storage element, like page numbers in a printed text, digital computing is de-narrativizing the record. "That is why the book is alive and will be alive until electronic information conquers the random access problem" (Paik 1980). In digital computing, the RAM, associate memory, and hashing have conquered this problem.

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[111] Nam June Paik, Random Access Information originally published in: Artforum, vol. 19, no. 1 (September 1980), https://www.artforum.com/print/198007/random-access-information-37725, accessed September 16, 2021

[Performative (human) vs. operative (electronic) "flux(us)": Can "Fluxus" be digitized?]

"The Nam June Paik center is dedicated to the artistic and intellectual legacy of Nam June Paik [...]. In addition to its function as an exhibition space, the Nam June Paik Art Center developed a new publication, *NJP Reader* [...]. The aim of the NJP Reader is to recontextualize Nam June Paik's artistic thought and his "random access" strategies in a topical discursive practice. A leading question is: What is the meaning of Nam June Paik's multi-medial experiments, performances, and sculpture for our current artistic practice and discourse?"[112] This is still a hermeneutic approach, as opposed to the media-archaeological distance.

The questionnaire for the first issue of the NJP Reader once asked, whether *artistic anthropology* is "a form of artistic communication defined by a *post-medium condition*? Or is it a practice that demands the concept of medium-specificity to change?"[113] Computation has killed the previous multi-media specificity indeed (Kittler 1986) by the "great transcription" into the digital code - but not on the level of its hardware archive.

This international symposium series is called *The Gift of Nam June Paik*, with the subject this year's conference being "Digital Video Archive", a video service platform to be launched next year. But the video legacy of Paik which has been electronic signal, by digitization or "online" access, rather refers to "data" which is the "gift" / "given" in the literal sense.

The notion of "Fluxus" art has first related to bodily human performance, but then operatively turned electronic. This became technically concrete with(in) the medium of electro-magnetic tape (both sound and video) where iron particles get magnetized. In the meantime, e-flux (New York) has become the name for a on-line "publishing platform and archive, artist project, curatorial platform, and enterprise" which was started by artists in 1999.[114]

But a digital platform is not (yet) an "archive". The difference between the institutional preservation of symbolic and technical record(ing)s, and the "active archive" as artistic research, is knowledge-productive itself

Paik's analog works have been *an*archival, while the legal memory institution called archive, as cultural heritage preservation, mummifies the Fluxus idea.

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112 https://www.e-flux.com/announcements/37354/njp-reader-1-out-now/, accessed September 25, 2021
113 https://www.e-flux.com/announcements/37354/njp-reader-1-out-now/, accessed September 25, 2021
114 https://www.e-flux.com/about, accessed 25 September 2021

An alternative is to create an archive of the analogue, embodying the electro-technical parameters (like in analog computing devices), as an equivalent to GitHub for Source Code.

Very media-archaeologically, Paik's media operations have been rather hard- than software-oriented.[115] What is lost in the digitized version is the unarchivable contingencies of the electronic real as the essence of "Fluxus" in the technical sense.

The Fluxus art movement during the 1960s and 1970s "engaged in experimental art performances which emphasized the artistic process over the finished product"[116], and therefore "some Fluxus artists came to describe Fluxus as a laboratory" (ibid.). "*Traitor, you left Fluxus!*, is the content of a postcard sent by George Maciunas to Nam June Paik, in the late year 1964, after the latter's involvement with Stockhausen's *Originale*" (ibid.).] But Fluxus, regarding one of its essential artistic media that is analog audio-visual electronics, can be understood in a less metaphorical way. "In physics, specifically electromagnetism, the magnetic flux through a surface is the surface integral of the normal component of the magnetic field B over that surface."[117] / "Magnetic flux is usually measured with a fluxmeter, which contains measuring coils and electronics, that evaluates the change of voltage in the measuring coils to calculate the measurement of magnetic flux" (ibid.). Faraday's law of induction here figures central: "[A] change in the magnetic flux passing through a loop of conductive wire will cause an electromotive force, and therefore an electric current, in the loop" (ibid.); a time function / time-based (electronic media) art: "the surface, in general, may be in motion and deforming, and so is generally a function of time. The electromotive force is induced along this boundary" (ibid.)

The electromagnetic video tape as such is a static record, but it requires to set the media-archival object in motion to reveal its artistic message. In concordance with the Fluxus aesthetics, a technical medium is only in being when being in signal-processing operation, therefore in "flux" in the technical sense. This directly links back to temporal signal articulation in Paik's early experiments with electro-acoustics. And in terms of entropy, Paik's tapes (either electro-acoustic, and video) themselves are still concretely in flux - closer to analog electronic with voltage than to abstract "digital" computation.

Two kinds of media-archaeological approach to the Paik media

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115 An argument substantiated by Scott Lash, unpublished paper
116 https://en.wikipedia.org/wiki/Fluxus, accesssed September 19, 2021
117 https://en.wikipedia.org/wiki/Magnetic_flux, accessed September 19, 2021

memory

"[T]he video archive will open up interesting possibilities in terms of media archeology" (conference draft 2021) indeed - both in its soft, and radical sense. Let us not reduce the notion of media archaeology to a mere preservation of "obsolete" technical items, but re-actualize them in the context of media-epistemic question, such as the relation between the analog and the digital, and, for example, computing *within* physics (quantum computing) *versus* the symbolical machine. In terms of material media archaeology, the value of "dead media" (Bruce Sterling) results from resisting their digitization, and to maintain their electro-material "veto" and electronic idiosyncrasies.

[Resisting the "great transcription"]

Its technical and thematic variety is an "important feature of the archive" (conference draft). How to defend this technical variety against its standardization by digitization which actually annihilates the sense of the term *media* itself[118]?

While the digital video "archive" will be rather a collection, the crucial "archival" issue lies in the preservation of the material (and media-technical) integrity of the record: defend / preserve the "analog" archival record against its digital "interpretation", just as much as a medieval parchment, in an archive, can not be replaced by its mere transcription into typography at the expense of its material enunciation. The irony is that digital oversampling now allows to emulate the physical object - in its integrity?

At a more fundamental level, the issue is to defend the virtues of the "electronic condition" against its transcription (and therefore erasure) into the digital.

The early Paik manifesto composed for the Radical Software journal claims that "the students of philosophy proper should [...] be exposed to today's electronic situation, instead of to parchment philology"[119]. Among the educational toys of Paik's electronic colour TV experiments ranges Paik's video synthesizer which he developed, between `1969 to 1971`, `together with television engineer Shuya Abe`. Paik emphasizes the explicit "instructional resource value" of such cybernetic pedagogics: "Dozens of playabilities can be assembled to a console and can be

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118 As is has been expressed in the notable preface to Kittler GFT
119 Nam June Paik, Extended Education for the Paperless Society, in: Radical Software, vol. 1, no. 1 (1968), 7 f. (7); https://www.radicalsoftware.org/volume1nr1/pdf/VOLUME1NR1_art02.pdf, accessed September 30, 2021

distributed to Kindergarten or elementary school."[120] Both media archaeologically and media epistemically, this invites to re-discover the virtues of analog computing, as expressed in Paik's 1968 manifesto: "My electronic TV shows various basic facts of physics and electronics concretely, such as amplitude modulation, radar, various scanning, cathode ray, shadow mask tube, oscilloscope, ohm's law, obertone, magnetic character, etc", as "a very pleasant way to learn these important facts."[121]

Paik's proposed a "Audio Tape Library"[122] rather than a genuine "archive". His 1968 manifesto is confusing the archive with a public collection, notably in his explicit entry "ARCHIVE": "In the age of information, the library of the university will become [...] as active as the Central Intelligence Agency in America. [Therefore, besides the above mentioned Jaspars-Heiddeger films etc [sic]., the following archive is suggested.]"[123] - which is a rather liberal notion of the "archive".

Paik's 1968 manifesto is materially re-integrating the digital into the analog: "every month much surplus and used tape is put out of service from the computer", which is proposed for its re-usage for "cheap video recording" (Paik 1968: 8). "I found that used computer tape (half inch) is useable on a Sony videotape recorder" (Paik ibid.). Ironically, with the digitization of the analog Paik video recordings, the "tape" now returns within the Turing machine itself (Turing 1936 / 37).

[Analog "Video Common Market" (Nam June Paik 1970) vs. Digital Livestream]

One purpose of this year's "Gift of Paik" symposium is to critically reflect the changes which occur to the analog video archive by the digital platform which allows for free online access to an artist's video work. This is the opposite of the ("secret") archive indeed, rather an open-access library in the sense proposed in Paik 1968.

Nam June Paik's rough sketch of a "Video Common Market" in 1970[124] could nowadays be re-interpreted as as a *futurum exactum* ("future in the past"), as an anticipative plea for an online streaming video archive.

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120 Paik 1968: 8
121 Paik 1968: 8
122 Paik 1968: 8, entry on "NEW USE OF SLIDE OR VIDEO TAPE"
123 Paik 1968: 8
124 Nam June Paik, Global Groove and Video Common Market (1970), from: Website Media Art Net, http://www.medienkunstnetz.de/source-text/88/, accessed September 30, 2021. Source: Nam June Paik : Video `n ´ Videology 1959–1973, ed. by Judson Rosebush, published by the Verson Museum of Art, Syracuse, New York, unpaged

The idea of a 'video common market' as envisioned by Paik now seems feasable by "plugging today's technology, current situations and perceptions into it" ("Gift of Nam June Paik 13" conference draft, 2021).

But this Internet-based communications have only been enabled on a technical level: digitzation, video compression algorithms and Internet protocols. After all, it has been "A Mathematical Theory of Communication" which has been designed by Claude E. Shannon in 1948.

After digitization as the price for online access, the analog signal archive hides more than ever behind the pixels. According to the Shannon / Nyquist sampling theorem, analog-to-digital conversion can perfectly emulate the original physical signal fidelity - while at the same time making any micro-moment, and any pixel, non-linearly accessible for mathematical intelligence in computational processing. But even if for human phenomenal impression the signal impression remains intact once sampled in twice as much frequency as the most intensive signal component, the physical signal has metamorphized into another essence, or mathematical being. In terms of a historicist biographical imagination, it looks as if Paik "would have accepted" (*sit venia verbo*) this cybernetic sacrifice in exchange for the new affordances of online access to a distributed video sphere. But in the name of video techno*lógos* and its implicit *l'archive*, media archaeology vetoes even against the author of such works, in a non-historicist, non-hermeneutic understanding of media knowledge.

[Algorithmicizing the Paik Archive: A Laboratory for Algorithmic Experimentation]

After the previous defence of preserving the "analog" video archive, a final turn proposes the differential virtues of the "digital archive".

A less historicist but more radical media archaeology is about the technical tools for revealing knowledge - which, next to the material aspect, is mathematical analysis as well. This means not simply "digitizing" but "algorithmicizing" the Paik video archive. So please, don't call digital video platform an "archive"; rather: a media-aesthetic laboratory for experimentation with signals.

Digitizing the Nam June Paik Video Archive allows for a more experimental, even nonhuman, rather algorithmic approach to this media-artistic legacy. The Foucaultean neologism of *l'archive* accentuates the generative aspect of such an "active archive" (as it is conceived by the artistic research group Constant in Bruxelles). Computation allows to discover "a new existential value of an archive" indeed (draft). "Normally, an archive is a collection of documentations and objects to be preserved

eternally. The archival materials thus preserved [...] are used as historical evidences or as supplements for understanding the context of an art work. Nam June Paik digital video archive [...] will be different from traditional archives in terms of its function and existential context" (conference draft), and rather "allow the users to go beyond their initial purposes, ultimately discovering and creating new meanings in the networks of the individual videos. It will be able to draw primary semantic maps using primary key words (taxonomic values such as persons, incidents, art works, exhibitions, historical periods). Then, based on the digital trace of the users, it will generate new networking algorithms" (ibid.) - which is the usage-regenerated archive against the traditional provenance principle in archival science. "[T]he new networks created by machine learning modules" will not only "allow us", the humans, "to depart from understanding Paik's works from a historical or aesthetical point of view in the traditional way" (conference draft), but allows machines to "deeply" learn with records related to "Paik" themselves, and reveal their techno*lógos* as an actual being, as a nonhuman insight.

The truly archival records in the Paik estate is mainly analog material - not to be confused with the "streaming video" platform made digitally accessible as the new, pothumous "gift" of Paik. The "digitized" - rather than: genuinely "digital" - Paik video works and fragments are opening new experimental possibilities for uncovering the inherent ("latent" computational space: multi-dimensional) value of such recordings. Such digital platform for algorithmic experimentation - or "cultural analytics" (Lev Manovich) -, though, is not an archive itself, rather a "phenomenotechnical" (Bachelard) laboratory for creating sparks of knowledge from big data entropy.

Would Paik's media-artistic curiosity and technology-based research, always open-minded, have made another turn into "artificial intelligence"? But such a question is already falling back into the historicist, biographic trap. The Paik archive might be addressed in a more distanced way, identifying the epistemic sparks.

WHERE ARCHIVAL "MEMORY" TAKES PLACE. Technical Storage, and its (Non-)Entanglement with Human Remembrance

To formulate it provocatively from the media-archaeological beginning: Truly "digital archives" are not about cultural "memory", but rather techno-mathematical topologies, differential operations of delayed transfer, and material, or energetic, storage. This invites for an adoption, and "archivological" redefinition, of Bakhtin's concept of the "chronotope", to technical storage - a temporal geometry which leaves behind the traditional "art of memory" rhetoric.

Against the anthropocentric focus by media phenomenology, and the rather discursive Humanities' perspective, "radical" media-archaeological analysis focuses on machine "storage", and its concrete techno-logical embeddings, rather than on humanly embodied remembrance. Far from technological determinism, though, this approach therefore argues for discovering storage mechanisms as a process with its own internal knowledge (techno*lógos*), while at the same time worth to be epistemically known from the human, cultural outside.

In a final outlook, and with an eye on the impact of current artificial intelligence practices of memory formation, this paper discusses to what extent the "memorization" processes, between human brain and electronic and computational technologies, are incompatible.

To avoid Misunderstanding: the Institutional Archive vs. *l'Archive* from within Computing

In non-metaphorial terms, the archive, and its operating systems, is a legal memory of administrative power. We may call it an aggregation of files: records that can be linked, *via* the archive's index (the inventory), to the discursive loops of institutional infrastructures.

The traditional archives have been disclosed by historians. Electronic memories, though, require data archaeologists rather than archivists.[125] Since computer technology was made for information processing, not for long-term storage, looking at data banks from the archivist's point of view may even be a hindrance in understanding its different "memory" nature.

The 21st century is developing an epoch beyond the archive. With data-streaming and network-based communication, the perspective shifts: the privileged status accorded in Western civilization to certain "permanent" cultural values and traditions from the past - the cultural ROM, as it were

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125 See Matthew Kirschenbaum, Mechanisms. New Media and the Forensic Imagination, Cambridge, MA (The MIT Press) 2008

-, increasingly gives way to dynamic exchange, a permanent transfer in the most literal sense.

Traditional archives will rather retro-actively remain as isolated islands of record storage, like "heterotopias" which is counter-spaces once defined by Michel Foucault, a monumental resistance against the dynamic re-organization of data flows.

The emerging regime of so-called "digital archives" transforms the conventional notion of the archive indeed. In a media-archaeological reformulation, the technical *l'archive* (in Foucault's sense) challenges the cultural institution of the archive. When being confronted with the technical materializations of Cartesian objects, which are mathematisable things, media archaeology describes the nondiscursive practices specified in the elements of the techno-cultural *l'archive* which should not be confused with the actual records office which in French is always pluraletantum (*les archives*) - a spelling most frequently mis-translated in the Foucault literature.

By defining *l'archive* instead, in a chapter of his Archaeology of Knowledge[126], a decisively different epistemology has been expressed by Foucault, shifting the analytic focus from memory repositories to the governing laws of data circulation as such - a return of the ancient *archeion* to *arché* in its old Greek sense, as Derrida reminds in his Archive Fever text[127]. Foucault's very distinctive use of the term *l'archive* does not refer to the totality of all received documents nor its bureaucratic institutions but, more abstracted, to the systems which governs the emergence and the processing of enunciations.[128] When Foucault's neographism is *media*-archaeologically applied to the technological condition, *l'archive* deals with hardware configurations, and data transfer protocols. *L'archive* is the diagram that formalizes processes, its tectonics as an active rather than passive agency of storage and transfer of signals and symbols. The technical act of archivization produces as much as it records the event[129]; *archivologically*, computational memory is rather than retrospective.

It is such techno-archival rules that govern what kind of digital memory can be expressed and retrieved (rather than "remembered") at all. It is not only human archivists any more, but in a higher degree than ever it

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126 Michel Foucault, The Archaeology of Knowledge and the Discourse on Language [FO 1969], transl. from French by A. M. Sheridan Smith, New York (Pantheon Books) 1972
127 Jacques Derrida, Archive Fever. Freudian Impression, in: Diacritics vol, 25 (1995), 9-63
128 Michel Foucault, Archaeology of Knowledge, New York 1972, 130
129 Jacques Derrida, Archive Fever: A Freudian Impression, trans. Eric Prenowitz (Chicago and London: University of Chicago Press, 1996), 16 f.

is technologies upon which the readability of such documents depends. The familiar archival record has become techno-mathematically sublime in electromagnetic latency - being there, but directly not accessible to human senses any more.

In contrast to the traditional notion of archives as record depositories, *l'archive* in Foucault's sense is a hidden agency within the Turing machine itself being defined by its constraining laws, or algorithm.[130]

But even the conventional "archive" returns *within* computer architecture, when a core element in the Central Processing Unit is called the "register", which is a term directly taken from archival terminology.

Just like the "secret archives" in previous empires, this regime is hidden from the public human user interface, as "protected mode" in programmed computer chips. Archival enlightenment, nowadays, means unlocking this Foucauldean *l'archive*.[131]

Chronotopia: "Archival Space" vs. Techno-Mathematical Topologics

A particularly focusing "on the relationship between space and memory" (draft) - is justified for human- and body-centered analysis. But within the computational sphere, "l'espace de l'archive" (Michel de Certeau) is replaced by mathematical topology, as implemented in the computational matrix.

This coincides with Foucault's diagnosis of "other spaces" in contemporary online media culture: "We are at a moment [...] when our experience of the world is less that of a long life developing through time than that of a network [...]."[132]

Just like Foucault's neo-graphic definition of *l'archive* is in contrast to *les archives*, his understanding of the term *espace* in French has a broader

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130 See M. Beatrice Fazi, Contingent Computation: Abstraction, Experience, and Indeterminacy in Computational Aesthetics, London (Rowman & Littlefield) 2018
131 See Friedrich A. Kittler, Protected Mode, in: idem, The Truth of the Technological World, Redwood City (Stanford University Press) 2020, 209-218
132 Michel Foucault, Des espaces autres [lecture 1967], in: Architecture. Mouvement, Continuité, no. 5 (October 1984), 46-49; English translation from the French by Jay Miskowiec: Of Other Spaces. Utopias and Heterotopias, in: Diacritics vol. 16, no. 1 (1986), 22-27 = https://web.mit.edu/allanmc/www/foucault1.pdf, accessed February 19, 2021, p. 1

sense than "space", and rather extends to "classification, segmentation, order, and exclusion"[133]. Such a "space" not only organizes archival records, but the "digital present" as such.

Digital topo-logics changes forms of storage and timescale[134] indeed. But media archaeology, as scientific analytics, rather explores the technical ground of such transformations, instead of Cultural Studies' focus on "their impact on organizing and interpreting memories and narratives" (ibid.). Data-based memory cannot tell, but only counts and computes. The algorithmic data retrieval system rather offers real time recognition of "connections and patterns in the data" (draft), than remembrance of a past.

Time and space are disentangled by the technical act of storage.[135] Since the archival record is not alphabetic letters on paper any more, but "big data" on magnetic tape[136], "la transformation de l'archiviste" is not simply "le départ et la condition d'une nouvelle histoire", but more fundamentally: "Il y a substitution d'histoire."[137]

Beyond the "Art of Memory": From Rhetorical *Techné* to Techno-Logical Memory Allocation

The close coupling of space and memory is the legacy of an ancient cultural technique: the mnemonic "art of memory" where "locative images" have an operational function in human memorization process.[138] Computer "memory", though, does not require such "imagination", and rather operates with geometrization (Stiegler, Vief), and operative diagrammatics.

[Once the image becomes electronic, its spatial dimension transforms into a function of time-critical media. A more multi-sensory approach has a "acoustemic ear" for dynamic, "resonant" forms of memory, such as Alvin Lucier's seminal media-art installation *I am Sitting in a Room* from

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133 Stuart Elden, Mapping the Present. Heidegger, Foucault and the Project of A Spatial History, London (Continuum) 2001, 117
134 Electronic communication by Tomoko Tamari, April 18, 2021
135 See Horst Völz, Speicher. Theorie, Technologie, Archäologie, ed. W. E. / Johannes Maibaum, Bochum / Freiburg (projektverlag) 2021
136 See François Furet, Quantitative History, in: Felix Gilbert / Stephen R. Graubard (eds.), Historical Studies Today, New York (W. W. Norton) 1972, 45-61
137 Michel de Certeau, L'espace de l'archive ou la perversion du temps, in: Traverses. Revue du Centre de Création Industrielle 36 (1986), 5 f.
138 See Frances A. Yates, The Art of Memory, London / New York (Routledge) 1966

1970, where the (re-)recording of acoustic signal delay becomes a "memory" of the room itself.]

[The ancient rhetorical artificial memory (*ars memoriae*) refers to locations and images - and thereby turns out as a function of the "heating" of the visual sense, at the price of "acoustic space" (McLuhan) or oral speech which became displaced by the phonetic alphabet - as expressed in the Platonic dialogue Phaidros as vintage media critique.]

There are significant differences between artificial memory in the ancient world and that of today's media culture indeed. According to Frances Yates, Cartesean analytic geometry killed the image-centered ancient rhetorical "art of memory" in favour of algebraic, numerical operations. The "museal" alliance between the ordering of memory and 'the sense of sight"[139] has since been abstracted into computation.

Already the "technologizing of the word" (Walter Ong) by the phonetic alphabet, in ancient Greece, displaced the oral memorization skills into coded storage - which, as symbolic order, is "memoryless" in itself. The increasing digitalization and computational technologies bring about variant formats for the externalization of memories, which Bernard Stiegler calls "tertiary retention mechanism". But advanced computational technologies are not simply technical "extensions" of human memory, but operational transformations of remembrance into storage technologies.

[The classical reference to the *ars memoria*, the Rhetorica ad Herennium, almost certainly cannot be ascribed, as long assumed, to Cicero. The human authorship itself has been erased in "archival" text transmission (a.k.a. " cultural tradition") a non-individual memory. Ironically, the seminal text on the art of memory, disguised in dialogic speech, dissimulates its own technique of communication machinery. But the technical truth is articulated by its very anonymization.]

[This reminds of philosopher Friedrich Nietzsche's proverbial experience with the - at his times - advanced medium of the typewriter, which replaced the cultural technique of hand-writing, still related to bodily experience, by abstraction: the mechanical coding, as discussed by Friedrich Kittler in his *Grammophon - Film - Typewriter* 1986 (pp. 293-301). Nietzsche, the author, here explicitly merged with the machine.]

"Memory", for the Turing machine, is simply an endless tape. This algorithmic mechanism actually concerns the memory technology. Obviously, Turing borrowed his thought experiment from a real writing technique, the mechanical typewriter. Only the mechanization of hand-writing by the typewriter, and the material interference of the typing

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139 Yates 1966=2014:19

lever (which separated the human hand from writing, with Heidegger), allowed for a new form of active forgetting, as has not been known in the manuscript tradition where the palimpsest still allowed for the previous letters to shine through the parchment, or the ancient wax tablet which always preserves to traces of erasure itself (a expressed in Sigmund Freuds piece on the "Magic Writing Pad"): the erasure of a letter by typing it again, through the interpolation of "Tipp-Ex" (the brand name for a white liquid used for identically printing over mistakes in a piece of machine typing).

[In a famous passage, the Rhetorica ad Herennium thematically turns "to the treasure-house of the ideas supplied by Invention, to the guardian of all the parts of rhetoric, the Memory"[140]. As it has been researched by Paula Findlen, the *musaeum* or *studiolo*, in Renaissance times, did not exclusively relate to an assemblage of material relics, but could be a conceptual space for contemplation ("musing") as well.]

"Today's physical traditional archive spaces are increasingly being incorporated into computer graphics and virtual realities (e. g. digital museums). They become hybrid spaces" (draft) in a precise sense: both electro-magnetic latency on the internal "subface" level (Frieder Nake) of computing, and its visual evidence on the optical interface. Such a virtuality is "real but not actual"[141]. From a radical media-archaeological point of view, though, the virtual (defined as genuinely "born digital") is as actual as it could be, in technical terms, with its voltages and hard-wired circuitry.

Memory, in terms of computing, is no *musée imaginaire* any more.

[The treatise Ad Herennium differentiates "natural memory", which is embedded in our minds, born simultaneously with thought, from its technical extrernalizations. In that sense, the *lógos* can not be separated from its mat(t)eRealization. Is the categorical separation between "natural" and "artificial" memory, in cybernetic terms, an ontological misconception of *memory-in-being* already? The "art" of memory is already an *ars* (resp. *techné*). But just as Heidegger's "Frage nach der Technik" has been mistranslated as his question concerning "technology", for the space-and-memory question for digital culture, it is vital to keep *techné* (ars memoriae) conceptually different from storage and retrieval techno-logistics.]

As long as human and cultural memory capacity is simply strengthened by a kind of training (*ars memoriae*), it is still a body-related cultural technique, in accordance with the "media extension" resp. "defective

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140 3.28-30
141 Rob Shields, The Virtual, London (Routledge) 2002, 43, as cited in draft

human" theorem (Kapp, Freud, Gehlen, McLuhan), but not yet escalated into genuinely techno-logical machinery which operates according to the logics of the machine.

While in the *ars memoriae*, memory "takes place" visually, in the Cartesean epoch, its location becomes arithmetic, which results in a technical operation: the so-called "memory allocation" in computing, such as the Random Access Memory.

In the von Neumann architecture of stored-program computation, it is usually the operating system which takes care of memory management[142] - which refers both to stored data, and the instructions (*archai*) to fetch them. In principle, they are located in the same so-called "memory" area.

This has a time-critical consequence: "a data operation cannot occur at the same time because they share a common bus."[143]

[Memory management in a Cartesean address space - different from physical memory - allows for dynamic memory allocation. Here, the techno-logical gap (or rift) opens, in a truly techno-logical division between symbolical, and physical, address space (as known from book storage in Library management). "Virtual memory systems separate the memory addresses used by a process from actual physical addresses beyond the available amount of RAM using paging or swapping to secondary storage."[144] Against Stiegler's notion of a "tertiary retention" which still refers to "analog" storage media, contemporary memory analytics rather "grounds" in the von Neumann architecture of computing where the set of commands becomes operationally co-existent with the storage of the data to be processed, within one and the same "memory" area - a techno-metonymic shift towards "stored-program computing". Once both the data "archive" and its rules of processing are expressed in the same binary code, and allocated in the same intermediary storage space (such as the proverbial "hard drive"), this allowings for non-linear, time-critical "memory" access.[145]]

["Memory management is the functionality of an operating system which handles [...] primary memory and moves processes back and forth between main memory and disk during execution. Memory

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142 Entry "Memory management", https://en.wikipedia.org/wiki/Memory_management, accessed April 20, 2021
143 Entry "von Neumann architecture", https://en.wikipedia.org/wiki/Von_Neumann_architecture, accessed April 21, 2021
144 Wikipedia, "von Neumann architecture"
145 See Alan Turing, State of the Art, xxx

`management keeps track of each and every memory location, regardless of either it is allocated to some process or it is free. [...] It decides which process will get memory at what time.`"[146] But between logical memory design, and its technical mateRealization, frictions occur. "Several issues complicate the implementation, such as external fragmentation, which arises when there are many small gaps between allocated memory blocks."[147] And different from rather dissipative, or "diffractive" (Barad) neuronal memory allocation, the system "must track outstanding allocations to ensure that they do not overlap and that no memory is ever "lost" (i.e., that there are no "memory leaks")"[148].]

In the ancient treatise on the art of rhetoric Ad Herennium, "locations" are still spatially defined, as "for example, a house, an intercolumnar space, a recess, an arch, or the like" (draft). Such imaginary architectures have become computer "architectures" in times of digital archives, and the "image" is replaced by alphanumeric addresses. While for the *ars memoriae* "an image is, as it were, a figure, mark, or portrait of the object we wish to remember", and then placed "in a definite location"[149], *imaging* in computing becomes a function of alphanumeric addresses of storage cells - a radical algebraization of the memory metaphor. "Iconic" memory transforms into alphanumerical storage management, and even electronic video imaging becomes dynamic.

"Searching images" is not visual, or "imaginary" any more, but exactly addresses the "image" as a two-dimensional data matrix, down to the least pixel.[150]

The logocentric subjection of images by verbal metadata is replaced by hashing, that is: the immediate addressing of the storage cell content itself. The artificial neural net approach of "deep" machine learning (starting with Rosenblatt's Perceptron) radically differs from the

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146 Web page "tutorialspoint", entry "Operating System - Memory Management", "https://www.tutorialspoint.com/operating_system/os_memory_managem ent.htm, accessed April 21, 2021

147 Entry "Memory management", https://en.wikipedia.org/wiki/Memory_management, accessed April 20, 2021

148 Entry "Memory management", https://en.wikipedia.org/wiki/Memory_management, accessed April 20, 2021

149 Ad Herennium, transl. by Harry Caplan, Loeb Classical Library, xxx 1954

150 See W. E. / Stefan Heidenreich / Ute Holl (eds.), Suchbilder. Visuelle Kultur zwischen Algorithmen und Archiven, Berlin (Kulturverlag Kadmos) 2003

logocentric transcription of signals into semantic "tags" as archival "metadata".

The Neuro- and / or the Techno-Logical Apprach to "Memory"

Once a human is "cybernetically" coupled to media machines, he / she is subject to their chronopoietic tempor(e)alities. But while cultural analysis asks, somewhat anthropocentrically, "how the digital / virtual-physical environment (space) acts on people to influence their encounter with objects [...] and their [...] memories" (draft), media archaeology shifts attention to the hidden agencies (*l'archive*) which pre-determine such encounters, and meaning-making, from within the machine.

In its radical formulation of the "techno*lógos*" hypothesis, media archaeology dispenses with culturocentrism. "Storage" solutions, in electronic computing, such as the ultrasonic mercury delay line[151], have not been invented to model human "memory". Engineers such as K. T. Sharpless, in 1948, even apologized for using that term by typing it in inverted commas: "The storage of information, often called 'memory' in large-scale computing machines [...]."[152]

In John von Neumann's seminal design for a stored-program electronic computer, his rather metaphorical terminology of "memory organ", the inverted commas already vanished in favour of the cybernetic human / machine system theory.[153] But the seductive model of the neuro-logical "brain memory", as an analog / digital hybrid[154], regarding its techno-logical instanciation by stored-program algorithmic computing, radically differs from its bio-logical actuality.

[The concept of a dynamically "delayed memory" embraces both human, and machine.[155] "Reverberative" data storage (such as the Acoustic Delay

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151 See Alan Turing, The State of the Art. Lecture to the London Mathematical Society on 20th February 1947, in: B. E. Carpenter / R. W. Doran (eds.), A. M. Turing's ACE Report of 1946 and other Papers, Cambridge, Mass., et al. 1986
152 T. Kite Sharpless, Mercury delay lines as a memory unit, in: Proceedings of a Symposium on Large-Scale Calculating Maschinery, Cambridge, Mass. (Harvard University Press) 1948, 103-109 (103)
153 John von Neumann, First Draft of a Report on the EDVAC, University of Pennsylvania, Moore School of Electrical Engineering (June 30, 1945), in: IEEE Annals of the History of Computing, Vol. 15, No. 4 (1993), 27-75, bes. Abschnitt 12 "Capacity of the Memory"
154 See John von Neumann, Computer and the Brain (Silliman Memorial Lectures Series), New Haven / London (Yale Univesity Press) 1958
155 See Wendy Chun, The Enduring Ephemeral, or The Future Is a Memory, in: Erkki Huhtamo / Jussi Parikka (eds.), Media Archaeology.

Line, and other forms of refresh memory, or D-RAM) comes closer to human neural "memory" circuits indeed.]

In 1949, Vannevar Bush proposed his "Memex" machine, as a rather hypertextual associative, brain-like *memory extender*.[156] This has been a radical departure from the taxonomical "library" order of records by metadata.

Nowadays "machine vision", and "deep" image recognition in AI, actually realize what has been envisioned in the *ars memoriae* approach - ironically not as a continuation of the ancient mnemotechnique, but - dialectically - because of its alphanumeric, non-iconic antithesis.

[Since Rosenblatt's "Perceptron" created to emulate human memory functions (1960), the algorithmic imperative in computer programming shifts towards artificial neural nets. With "machine learning" from huge "big data", which have been created in so-called social media, practices of human meaning-making and remembrance are adapted by the computational machine - but just phenomenologically.[157] Electronic media, by themselves, have no sense of "past time". What appears like semantic memory "layers" and convolutions, from a radical media-archaeological perspective, in artificial neural nets, is still initially driven by the "cold" algorithm.]

The Arrival of the Digital Archive

[With the emergence of massive digital storage, the potential of the archive for memory has exploded into new possibilities (Foucault's *l'archive*). While traditional archives can be understood as space of 'the temporal fixture of its objects and the spatial ordering of them'[158] and preservation for remembrance, "digital archives provide various functions: multi-media experience, data engineering for easy access through search engines, and liberation from tempo-spatial limitations. All these functions are realized by the networking and navigating capacity within algorithmic systems" (draft). This correponds with the current shift

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Approaches, Applications, and Implications, Berkeley / Los Angeles / London (University of California Press) 2011, 184-203
156 Vannevar Bush, As we may Think, in: Atlantic Monthly, no. 176 (July 1945), 101-109
157 See Ben Jacobsen / David Beer, Social Media and the Automatic Production of Memory. Classification, Ranking and the Sorting of the Past, Bristol (Bristol University Press) 2021
158 See Jihoon Ki, The Archive with a Virtual Museum: The (Im)possibility of the Digital Archive in Chris Marker's Ouvroir, in: Memory Studies vol. 13, no. 1 (2020), 90-106, referring to Blom et al. 2016, and Rossaak 2011

from the concentional "data bank" approach towards artificial neural nets.]

From the media archaeological viewpoint, 'the traditional archive becomes deconstructed by the dynamics of digital online techniques. While down to the European Renaissance, the mnemotechnical "art of memory" has linked memory to space, as it is the case with the traditional archives, nowadays permanent storage is becoming liquid in electronic circulation. The rigid link between memory and space is disrupted. The "reading only paradigm" in the archival regime (literally ROM) is being superseded by a generative, participative form of decoding.

["The techno-logical nature of digital and networked archives, such as the Internet (e. g. Wikipedia) disrupt traditional institutionalized archives in which still human 'experts' or 'archivists' select and assign for permanent storage. "Whereas digital archives allow users greater ease to share, reuse, remix and even modify content. This user-oriented process is always processual and often temporal. Memory can be continuously transferred and temporally recycled. Hence, for the digital networked archive, space become less vital, and it becomes a time-critical networking communication (endlessly updating real time data).]

The user-oriented data processing, on the surface level, seems to enhance the "'creativity' of digital archives as a new meaning-making (narrative) generating device" (draft). But such a narrativization is a misunderstanding of the non-discursive "law" (both juridical / administrative, and technical) of archival storage. Non-narrative computation suspends "cultural memory", as investigated by Cultural Studies, from its premature semantization, in favour of operative formalism.

[Can there be "Digital Archives" of the Present? Desktop Administration vs. Archival Order]

In terms of Foucaultean discourse analysis, the "archive" (*l'archive*) is not primarily about material records, but rather about their relations and layers. The icons on the computer desktop, as registry (to use an archivological term) only bear a metaphorical relationship to the internal organization of files (the "archival subface"[159]) in the von Neumann architecture of computing. It therefore requires analytic diagrammatics to render such relations visible for

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159 See Frieder Nake, Das doppelte Bild, in: Bildwelten des Wissens. Kunsthistorisches Jahrbuch für Bildkritik, vol. 3, ed. Margarete Pratschke, no 3 (2005), 40-50

Media-archaeological analysis critically questions the metaphorical migration of archival terminology into computer technologies, down to mobile communication devices that socialize micro-"archiving" practices.

The notion of the computer desktop rather refers to the administration of the present than to an archival site in the archivological sense which is remote, and intentionally locked against immediate "online" access. Its setting-apart from the immediate present defines the archive as Foucaultean "other space", contrary to short-term memory in human perception.

"Mobile media" is not only producing new kinds of spatial memory[160] but moves "times" as well through the process of immediately "archiving" everyday life data snapshots.[161] Desktop metaphors are evolving towards time rather than space. David Gelernter's "candidate for replacing the desktop is called 'Lifestreams'"[162].

A media archaeology of the memory of the present requires a non-historicist diagnosis of information society. "Social media" platforms like Facebook, Twitter, and Instagram have long been functionally and visually organized on the explicit "Timeline". This chronicle-like symbolical order of time is displaced by the Newsfeed algorithm, a dynamic cluster of different factors or coefficients structuring the representation of events. With the instant messaging and newsfeed services like Snapchat, recorded events become visible for a fraction of time only; memories of present become ephemeral again.

But should such digital micro-repositories still be called "archive" in its rigid institutional sense? Users of "social media" are rather existing in an automated short-time, intermediary storage sphere, as "delayed present". In computational terms, Random Access "Memory" supersedes the traditional Read Only Memories.

In ubiquitous computation, the technologies of planetary micro-storage (from its most literal technical level up to user-oriented interfaces) are transforming the former archival distinctiveness and remoteness by coupling data storage to immediate "online" consumption in the present. Thereby, the archive loses its quality as "heterochrony" and "other space" (Foucault).

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160 See Jordan Frith and Jason Kalin, Mobile Media and practices of place-based digital memory, in: Space and culture, vol.19, no. 1 (2016), 43-55
161 David Capener (part of the Digital Studies Network founded by late Bernard Stiegler) has been running a seminar at the Technological University in Dublin called *The Archive of Everyday Life*
162 David Gelernter, Machine Beauty. Elegance and the Heart of Technology, New York (Basic Books) 1997, 102

What is missing here is the gatekeeping function of *triage*: an archival term which has been borrowed from medical emergency action, denominating "the process of determining the priority of patients' treatments by the severity of their condition or likelihood of recovery with and without treatment [...]."[163] When intermediary storage resources are insufficient for all to be kept for ages, sorting out is mandatory - a kind of "discrimination" which is genuine to the "digital" as such. In archival science, triage means the selection of incoming administrative records: the decision between ephemeral, redundant, and valuable, enduring data. In automated data circulation, the human archivist is replaced by the gatekeeper function of algorithmicized decisions about lang-term storage - actually, literally "logical gates", a radical cybernetization of the archive, the cyberarchive.

Embedded Knowledge, and the Material Embodiment of "Memory" in the Machine

Embedded "remembrance" (as a function of learning, and its material grounding in hard- or wetware) differs from techno-logical storage as long as the latter is reduced to the symbolical machine.

Biologically, as well as techno-materially "embodied memory" has an enunciative dimension which is not reducible to human speech or symbolic code, "since their physical presence affect the outcome of their gatherings"[164]

Narrative knowledge formation is displaced by algorithmic computational systems, in the concept of the Universal Turing Machine. The socio-logical "we", and the "body", in media culture, is not only "extended" to sociotechnical nonhuman agencies (Latour) any more, as in the ANT and STS approach. Media archaeology "radically" dives into "alien phenomenology" (Ian Bogost) from *within* technology, tracing the escaping techno*lógos*.

Beyond the "Platonic" concern for the externalization of memories, ranging from the cultural technique of alphabetic writing to the "tertiary retention" of recording media in the present (Stiegler), the more fundamental risk is to lose the knowledge of technological production itself - both in terms of hardware (engineering) and of software (programming), when the algorithm recedes into "deep" neural nets. While Stiegler's concern still meets Plato's critique of alphabetic writing

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163 Wikipedia, entry "Triage", https://en.wikipedia.org/wiki/Triage, accessed May 30, 2021

164 Judith Buthler, as paraphrased by Katharina Loeber, Big Data, Algorithmic Regulation, and the History of the Cybersyn Project in Chile, 1971–1973, in: Soc. Sci. 2018, 7, 65; doi:10.3390/socsci7040065

in the Phaedrus dialogue, the "loss of knowledge of the technology itself" (notes Tamari) coincides with Heidegger's concern for "being", and the OOO approach. There is intero-technical, endo-epistemic media (self-)knowledge instead.

While the conventional archive is bound to the alphabetic record, media "archivology" moves beyond textual analysis, and rigorously engages with the technical relic itself, in a double sense. One the one hand, there is the sheer physicality of the archive as cultural technique: its architectural archi"tectonics", its storage dispositive. And on the other hand, there is the structural memory within the machine itself, as enduring incorporated knowledge – the "fixed capital" (in Karl Marx' terms).

The design for a vintage masterpiece of mechanical computation, Charles Babbage's Difference Engine no. 2, has been preserved in the archive. His detailled circuit diagram of his remained unrealized since 1849, as a paper machine, in latency. But is has not been historicized, but time-delayed, to be materially realized only in the present. On the occasion of Babbage's 200th birthday in 1991, at least the central arithmetic unit of his Difference Engine no. 2 has been belatedly constructed by the Computer Department of the London Science Museum - as "a modern original of an old design"[165]. Such a fusion of the logical "archival" past with its mat(t)eRealization in the present is a different concept of the "digital archive" already, an "organizational memory"[166], or "structural storage"[167] in its the radically techno-mathematical (media-archaeological) sense.

"Memory" as Artificial Intelligence - Human, and / or Machine?

Philosopher G. W. F. Hegel, in his *Philosophische Enzyklopädie*, clearly distinguished between external memory techniques and mechanical storage, and psychically "interiorized" remembrance. From a phenomenological point of view, human memorization seems to be worlds apart from technical storage procedures. "Human Perception subtends the Algorithm."[168]

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165 Doron Swade, Virtual Objects - Threat or Salvation?, in: S. Lindquist / M. Hedin / U. Larsson (eds.), Museums of Modern Science, Canton, Mass. (Science History Publications) 2000, 139-147 (142)
166 See Klaus Krippendorff, Principles of information storage and retrieval in society, in: General Systems, vol. 20 (1975), 15-34
167 On "Strukturspeicher", see Karl Steinbuch, Automat und Mensch. Über menschliche und maschinelle Intelligenz, Berlin et al. (Springer) 1961, 106
168 Tomoko Tamari, chapter title for idem (ed.), Animation, the Body and Affect: Human Perception and Digital Information Technologies, book proposal to Bristol University Press, 2021

Both regimes, though, are linked by the inevitable material "embedding" of symbolic codes (*lógos*) between losely, or rigidly coupled "wiring" of neural, or technical, circuitry - be it technical hard-, or human wetware. The apparent incommensurability is dissimulated by Artificial Intelligence arising from ("Deep") Machine Learning in artificial neural nets, where "deep" learning results in "memory"-like functions like image recognition and trans-archival, dynamic clustering of items by similarity (instead of rigid classification).

This emulation has been starting with McCulloch's and Pitts' neural brain calculus, and Rosenblatt's Perceptron for optical *Gestalt* recognition.

So far, the actual techniques of emulating human intelligence and "memory" processes have been drastically different from the neural brain network. But beyond "symbolical AI", artificial neural nets approach the human "psychic apparatus" (Sigmund Freud's term) itself. But returning to the epistemic premise of cybernetics and Turing's theory of the computational mind, the modelling of human signal processing by algorithmic machines does not simply result in an emulation of the human mind, but - in reverse - *media-actively* reveals the human mind as neural mechanism itself. From the cybernetic AI perspective, not only machine storage, but even human memory has been "artificial" - that is: technological - from the beginning.

Archival Times:

ARCHIVAL TIMES. TEMPOR(E)ALITIES OF MEDIA MEMORY

"History" and the historical discourse belong to the cultural technique of alphabetic writing, formatted in linear texts on paper. Within that galaxy, the archives have served historians as a basis and resource, that is: to re-write alphabetic evidence in historiographic texts (basically narratives). But with the emergence of electronic media a shift of emphasis took place in the occidental memory sphere: from culture as a primary function of its storage (places, monuments, institutions) towards the dynamic recycling of data from the past, from emphatic long-time storage towards short-time affordances and immediate transfer. This affects the position of the archive and requires critical reflection from the side of both archival and media studies.

Media-theoretical analysis focuses on the message of the medium itself. Applied to memory agencies and especially the "digital archive", this method demands not only a close analysis of its technology but a new interpretation of its different epistemological and aesthetical dimension as well. While the traditional archival format (spatial order, classification) will in many ways necessarily persist, the new archive is radically

temporalized, ephemeral, multimodal, corresponding with a dynamic user culture which is less concerned with records for eternity but with order in fluctuation. "Memory is transitory."[169] New kinds of search engines will not only answer the needs of knowledge retrieval but develop into a creative "art of the archive" itself. Technical storage favoures discontinuous forms of memory access, either by alphanumeric metadata, or by addressing digital items from within.

"The Archive in Motion"

At *The Archive in Motion* conference in the National Library in March 2009, cold temperatures and snow reminded of the "frozen time" aesthetics of the traditional archive and practically even of the conservation conditions of audiovisual records in cool rooms (probably like in Mo I Rana, the storage facility for audiovisual records of the Norwegian National Library).

The National Library at Oslo with its Department of Research in fact belongs to the avantgarde of re-thinking the issues of information heritage in Europe. The National Librarian Vigdis Moe Skarstein proudly claims nothing less than the mandate to preserve and give access to Norwegian memory into the future - like the trajectory of a cultural missile, transmitting knowledge, the mission of this National Library. This claim is justified, since the updated Legal Deposit Acts from 1989 have achieved for Norway what the Institut National Audiovisuel (INA) in Paris achieved only years later and what a German media archivist could still only dream of. In 1989, when the Iron Curtain dividing West and East Europe opened in so many ways, the wall which separates the Gutenberg Galaxy of printed publication from the emerging new media of the 20th century, fell here in Oslo, opening a fundamentally new concept of the multimedia collection. The Oslo 1989 Legal Deposit Acts opened a new horizon of a national library for the 21st century; 200 years after the French declaration of human rights, this was a delaration of "media indepence" in the overall task of receiving, preserving and transmitting public knowledge from overall in Norway.

The emphasis here is not only on preservation of such heritage in its most obvious way, as known to museum, libraries and archives for generations. The Oslo policy adventurously faces the challenge of the new "digital structures" (and poststructurally: dynamic, temporalized structures) which transform such knowledge. This requires both technical and theoretical knowledge. Maybe there is nothing as practical as a good theory indeed; but let me envision here for a moment that conferences

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169 Section 6 in: Vannevar Bush, As We May Think [*1945], https://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881, accessed January 29, 2018

on archival theory and others which face the more practical challenges of preserving the new kinds of records, while being of highest quality in themselves, will not be conceptually separated any more, but f. e. the engineering questions of how to organize digitized phonographic records (like Edison cylinders) might be directly coupled with the theorems of media-archaeologist, thus short-circuiting the "two cultures" (C. P. Snow 1959) which do not only traditionally separate the Philosophical Faculties at universities from the Faculties of Science, but which separate the theoretical musing about archives from the practice of actually running them. The semingly purely practical questions of technical conservation can not be set apart from the theory of archival transmission in culture, but rather ask for integrating technical expertise with epistemological reflection. "In this moment of transition from analog to digital, theorizing archival practice is not only urgent for film archives, but also for media scholars."[170]

Electroengineers, technical conservators and computer programmers are much more open for such an immediate coupling with theory than usually assumed, and in reverse academics from the so-called humanities, dream of "grounding" their theories and knowledge in what actually happens, to arrive at a transitive, object-related implication of their theories.

Archival time layers

"All those documents of and on an era, made accessible by lists, card-indexes, computer catalogues, together with material facilities such as tins, files, boxes and cupboards and all kinds of reading equipment, constitute a 'time machine'."[171] But as symbolic order (which according to Jacques Lacan always already implies the machinic[172]), archives are no time machines at all. They need external discursive (so-called "historical") imagination to generate a sense of time. As long as the archival records consist of strings of symbols (i. e. alphabetic writing), a cognitive distance - in spite of the auratic qualities of handwritten manuscripts or autographs - can be more or less kept, since an act of decoding has to take place which involves the cognitive apparatus. But once photography and phonography, the first apparative media in its modern sense, became subject of the archive, the sense-affective, presence-generating power[173] of signal-based media cuts short the

170 Giovanna Fossati, From Grain to Pixel. The Archival Life of Film in Transition, Amsterdam (Amsterdam University Press) 2009, 16
171 Tjebbe van Tijen, We no longer collect the Carrier but the Information, interviewed by Geert Lovink, in: MediaMatic 8#1 (19xx)
172 See Friedrich Kittler, Die Welt des Symbolischen - eine Welt der Maschine, in: ders., Draculas Vermächtnis. Technische Schriften, Leipzig (Reclam) 1991, 58-80

distance which is a prerequisite for *historical* analysis, in favor of mnemonic immediacy, like an electric choque.

While the content of the digital archive might still be administrative, social, or cultural memory in its discursive sense, its actual message is a de-historisation of records. Their "online" accessability transforms spatial and temporal (emphatical "historical" distance) into a buffer memory of the extended present. In tele-communicative memory, the emphatic discursive division of time into past, present, and future, transforms into an augmented "thick present" (Hans Ulrich Gumbrecht)

The very term "tradition" shifts from its emphatic macro-temporal ("historical") notion to the analysis of the time-based and time-basing micro-mechanisms of transmission. While tradition has been associated with long-time memories across deep historical time so far, this emphatic horizon now seems to shrink to a mere extension of the present (as its re- and protentive short-time "working memory") - a dramatic shifting of the temporal prefix.

As a spatial structure and a diachronic memory the archive splits into two axes (like in a Cartesian diagram). The archival texture itself is a structure: a synchronic latticework, while its "content", the records, are diachronic documents of various age. Archives are not only in transition in macro-temporal perspective (as contemporary history); more concretely, on their very operative level, they are permanently in micro-time-critical transition (electronic signal and data processing).

The traditional archive model is emphatically static, residential, a storage space which delays time. The archive as fortress of memory is protected space in order to gain time. But with the acceleration of transport and communication media since the age of the Industrial Revolution a shift of emphasis from emphatic long-time preservation to ultra-short intermediary storage took place - a direct effect of electronic media culture itself.

The traditional mandate of the archive to preserve records for future use shrinks to the micro-temporal digital operations in the extended present. Intermediary storage here is necessary for "realtime" computation calculating the immediate future from memory of the immediate past.

"Temporalities" and "tempo-realities"

The typography of "tempor(e)alities" oscillates between "temporalities" and "time-realities" of the achive. Archival usage becomes time-critical. The temporalities of archives refer to the inherent temporal essence (the

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173 See Hans Ulrich Gumbrecht, Production of Presence. What Meaning Cannot Convey, Stanford University Press 2004

Eigenzeit) of archives as memory institution and storage media, wherease the tempo-realities refer to the function of the archive as *a priori* condition of historiography and cultural memory.

There are three conflicting time orders in the archive: on the one hand, it is meant to suspend time to transfer information for future memory (negentropic time); on the other hand, it is subject to time at work (entropic processes, material decay); thirdly, the speed of access, migration[174], short-time memorial functions of the archive increases with its digitization.

While the symbolical order (on the code level of archival records) is rather time-invariant, its material implementation is subject to entropy: temporal("historical") decay reminds of the physical real(ity) of the archive.

The "negentropic" cultural effort (Vilém Flusser) is meant to be that libraries and archives stem the tide of memory loss.[175] At this point, a precise differentiation is mandatory, between Shannon entropy and Boltzmann entropy. Two different times are at work here: a) symbolically coded information "time", rather invariant towards historical change, and b) physical time (the "tempus edax" known from allegories of Chronos in the Baroque). The fact that (as long as the code is familiar) an inscription can be deciphered against the deteroriation of its material carrier hints to the astounding invariance of symbolic inscription (the archival regime) against historical ("passing") time.

The archive equals the function of the channel ("merely the medium") in Shannon's techno-mathematical theory of communication, being the macro-temporal "inbetween" of what is generally called tradition of (alphabetically) *coded* records. In hermeneutic reading it is part of a communicative structure, thus containing messages to posterity, with the historian (and other readers) placing themselves as the "reveiver" of the archival content; in an anti-hermeneutic perspective, though, the archive is a set of multimedia monuments taken out of the consumptive economy of (historical and actual) time.

But the "time inbetween" ("media" time in its Aristotelean sense of *to metaxy* - the physical "inbetween" which he notices by the delay echo sound takes between sender and reveiver) replaces the monumental claim of virtually eternal storage of documents by the classical archive (and its records) on severel levels: both as an institution of temporality and in its material sense (the vulnerability and volatility of electronic data).

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174 See Dietrich Schüller, Von der Bewahrung des Trägers zur Bewahrung des Inhalts, in: Medium Nr. 4 (1994), 28-32
175 See http://lyra.rlg.org/ArchTF/tfadi.intro.htm#fragility

Computational micro-archives

Nowadays, with the direct coupling of the archive to "online" communication, a cybernetic short-circuiting of the formerly separate archive to the operational present takes place, shifting the archive's epistemological status and temporality. While in former administration there has been a clear separation between the "register" (the short-time depository for administrative records which are not in current use but might be at any moment be needed for re-use, close to the "op room", the administrative office itself) and the "archive" (physically reparated from the working office, a place to sort and select records for long-time legal claims), today the archive merges with the register itself.

At that point, a very seductive comparison with what happens within the computer imposes itself: In the Central Processing Unit, "registers" serve to store data for intermediary calculations - not to be called an emphatic "memory" at all. Directly associated with the CPU but external to it is the working memory which stores a) actual programs and b) the data to be processed, divided into ROM (Read Only Memory) and RAM (Random Access Memory).

Intermediary memory is well known from electronics, especially from with the heart of the digital computer, the Central Processing Units with its ALU (the arithmetic/logical unit). Here, registers in the techno-mathematical sense (a term borrowed from archival science) are devices built from bi-stabile relays (either electro-mechanical or fully electronic) for *transient* storage of digitally represented values.[176] The core function of such mirco-temporal storage devices is its passing essence and to let the data immediately become past - the other side of the archival dispositive, extended by the parameters time and clocked rhythm.

What in commercial trading logistically is known as so-called *chaotic storage administration* happens micro-archivally on computer discs as well. On the storage medium Compact Disc the data are interlaced: not sequentially in their temporal sequence, but dissipative. Archival order as precondition of tradition itself is being dynamically temporalized and undercut by the micro-dramaturgy of electronic storage media. "Colossus had to 'remember' a bit for a split second until its neighhour arrived. For this task, it used a bank of capacitors which it charged up and discharged as needed."[177]

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176 "[...] die vorübergehend eine Zahl speichern können": A. Huber, Programmgesteuerte elektronische Rechenmaschinen, in: Funk-Technik Nr. 24/1957, 828-830 (828)
177 Barry Fox / Jeremy Webb, Colossal Adventures, in: New Scientist no. 1081, May 10, 1997, 39-43 (41)

Data extrapolation: The unfolding of time-critical processes into a temporal horizon

The grammatical time form "future in the past" has become technological, based on predictive feedback operations. This horizon once unfolded in the context of ballistic calculation (*linear prediction*) and analysis of time series was techno-mathematically absorbed into calculating space. The difference between machine time and human time is dialectically synthesised in the cybernetic model, as indicated in the sub-title of Norbert Wiener's classic of 1948 ("command and control in the animal and the machine").

From archival statistics (memory based on scriptural archives, listings and charts as distribution in space) we move to stochastic time series analysis (dynamic remembrance based on algorithmic signal analysis of temporal series).

This recalls central terms from Edmund Husserl's *Phenomenology of the inner temporal consciousness*: the falling-back ("Zurücksinken") of an immant temporal objects from the state of now into the past (retention), while it still affects the presence (in the sonosphere known as the echo of tones, with visual stimuli in the after-image which remains on the human eye retina for a moment even if the light source is already extinct). Complementary to this retention, human perception always already pre-calculates (and thus anticipates) the immediate future (protention).

A techno-mathematical correlation to such analysis of temporal series is the compression algorithm developed by Jacob Ziv and Abraham Lempel: "We employ the concept of encoding future segments of the source-output via maximum-lenght copying from a buffer containing the recent past output. The transmitted codewords consists of the buffer address and the length of the copied segment. With a predetermined initial load of the buffer and the information contained in the codewords, the source data can readily be reconstructe at the decoding end of the process."[178]

What used to be the role of the emphatic archive in the context of macro-temporal cultural tradition becomes part of a permanently dynamics of the intermediary archive: the buffer.[179]

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178 Jacob Ziv / Abraham Lempel, A Universal Algorithm for Sequential Data Compression, in: IEEE Transactions on Information Theory, Bd. IT-23, Heft 3 (Mai 1977), 337-343 (337)
179 See Wendy Hui Kyong Chun, The Enduring Ephemeral, or The Future Is a Memory, in: Erkki Huhtamo / Jussi Parikka (Hg.), Media Archaeology. Approaches, Applications, and Implications, Berkeley / Los Angeles / London (University of California Press) 2011, 184-203

Order in fluctuation?

Different from the traditional script-based institutional archive, the electrified archive (as organized by the internet) becomes radically temporalized. It is rather hypertemporal than hyperspatial, being based on the aesthetic of immediate feedback, recycling and refresh rather than on the ideal of locked-away storage for eternity. The aesthetics of recycling, sampling and cultural jamming is a direct function of the the online-availability of (multimedia) archives. Once the archive is being coupled to the "online" economy of time, such a data disponibility has created a cybernetic system of re-cycling.[180]

Contrary to the familiarized occidental culture of knowledge (ranging from oral and scriptural tradition to electronic transmission), the age of electric media generated what the art world spotted as "Fluxus", literally: the flow (inculding steady-state in flow and order by disorder).

What is new in the so-called digital age, is the permanent temporality not only of the archival records themselves but of its archival infrastructure (called hardware and software) as well. So the traditional "time base" of archive itself becomes a function of temporal change, resulting in the data-streaming archive.

There is no "Time" in the Archive

Against all kinds of noise in the communication media channel - which, by no coincidence, is a sonic term itself -, culture is the struggle for symbolic - if not "musical" - order. Such an order against time is the archive.

The archive is rather "heterotopic" in Foucaults sense. Explicitly, "[...] there are heterotopias of indefinitely accumulating time, for example museums and libraries. Museums and libraries have become heterotopias in which time never stops building up and topping its own summit [...]. [...] the idea of accumulating everything, of establishing a sort of general archive, the will to enclose in one place all times, all epochs, all forms, all tastes, the idea of constituting a place of all times *that is itself outside of time* and inaccessible to its ravages, the project of organizing in this way a sort of perpetual and indefinite accumulation of time in an immobile place, this whole idea belongs to our modernity."[181]

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180 Declared in the thematic abstract of the festival *Re-*.
Recycling_Sampling_Jamming. Künstlerische Strategien der Gegenwart (Berlin, Akademie der Künste, 26-28 February 2009); www.recycling-sampling-jamming.de
181 Michel Foucault, Of Other Spaces: Utopias and Heterotopias,

Opposite to heterotopias such as archives and museums "that are linked to the accumulation of time, there are those linked, on the contrary, to time in its most flowing, transitory, precarious aspect, to time in the mode of the festival"[182]. This "festival" has become technical chronopoetics in the meantime.[183]

Liberating Memory from the Archive? Artistic vs. Technical Decoding

The institutional archive (different from the technical *dynarchive*) is *a-temporal*. It becomes "processual" (Cramer / Büscher) only by its multiple acts of human and / or technical decoding.

Archival restrictions of access are usually considered negative in memory politics. But the archive is not primarily a cultural but a legal institution. The most severe archival condition is that one is not allowed to change the material storage medium, or symbolic inscription, of the archival records themselves - in contract to any re-enactment of evidence by artistic performance. This leads to a frequent misunderstanding of the rigid institutional "archive" in artistic research which questions

Derrida's concept of *différance* corresponds with a dynamic understanding of *chronotopia* indeed, with respect to the archive, if it means decoupling an archival records from its institutional frame, and shift "a source document into another cultural and temporal dimension"[184]. A multiple approach to the decoding of archival records is invited indeed, as long as the code itself remains unchanged - otherwise, the operating system crashes, as we know from computing.[185] In an actual techno-archival context, Derrida's neographism of *différance* requires a more precise description.

But caution, let us not confuse the open(ing) re-reading of archival records with the rigid formal processuality (algorithm) of the

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translated by Jay Miskowiec from the French version ("Des Espace Autres", published in: Architecture / Mouvement / Continuité, October 1984), in: Diacritics, Spring 1986, 22-26; quoted here from the online version http://web.mit.edu/allanmc/www/foucault1.pdf, accessed 12 February, 2019 7, *italics* W. E.
182 Foucault 1984 / 1986: 7
183 See W. E., Chronopoetics. The Temporal Being and Operativity of Technological Media, transl. by Anthony Enns, London / New York (Rowman & Littlefield) 2016
184 As expressed in an electronic communication by Akis Sinos, 2nd March, 2021
185 See Friedrich Kittler, Protected Mode, xxx

administrative archival order itself.

The artistic liberation of the archive[186], or even "gendering" beyond the "patriarchive"[187], is actually not dealing with the archive any more, which simply does not invite for experimentation such as in a museum. As we know from digital media, for example communication *via* Internet only succeeds as long as its protocols are *not* changed.[188] Any metaphorical artistic dis-location of archival records, in virtual space, simply re-affirms the laws of computational space itself. There can be no real "heterotopy" (Foucault) here, since when we are *online*, we are always already contained *within* the technical laws, material infrastructures (like glass fiber cables) and logical protocols.

The "archive" is both the name for a (mate)real building ("hardware") and a symbolic system of organizing documents according to rules, which is literally based on symbolic letters such as so-called "software". In the technomathematical context of contemporary media, the function of the traditional archive is replaced by the rules governing computer hardware and the algorithms governing data retrieval, a different "symbolic machine". This comes closer to Michel Foucault's abstract use of *l'archive* (instead of *les archives* in the bureaucratic, juridical and governmental sense). Still, Foucault's use of the term is a permanent source of misunderstanding, of confusing *l'archive* as a generative grammar with *les archives* in the traditional meaning. So maybe let us abondon this very term in the age of digital media?

Becoming time-critical in electronic coupling: From space-based to time-based archives

The traditional paper-based archives are becoming time-critical when subjected to electronic filing systems, with its dramatically shorter access and retrieval times. Decentralized online-accessability becomes a priority of techno-archival records, beyond their former "local" space-boundedness, allowing for simultaneous archival file-sharing by serveral people at once. But even "The Cloud" can still be located materially, and logically, in computer server farm such as Google's.

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186 See the "Editorial" (Barbara Büscher + Franz Anton Cramer), February 2021, to the thematic issue of the online journal MAP (Media Archive Performance) MAP #11 "Bewegliche Zugänge: Werk-Geschichten und temporär genutzte Orte", http://www.perfomap.de/map11, accessed February 15, 2021
187 Jacques Derrida, Archive Fever, Chicago (University of Chicago Press) 1998
188 See Alexander Galloway, Protocol. How Control Exits after Decentralization, Cambridge, Mass. / London (MIT) 2004

The corresponding term *within* computing is record"allocation", that is: the administration of computer memory space, its addresses, its valorization, and real-time "archiving".

Archival *space* (as defined in Michel de Certeau's "l'espace de l'archive"), by digitization and online access, is becoming radically temporalized. Understood with Marshall Mcluhan, this is due to the fact that archives and libraries change from the "Gutenberg galaxy" to the electric, or to be more precise: the electronic age where streaming itself is both the technical condition and the phenomenon of archival information.

The traditional archive as institution is deconstructed by the implications of digital techniques. Since antiquity and the Renaissance, mnemotechnical storage has been linking memory to space; nowadays the static residential archive as permanent storage is being replaced by dynamic temporal, intermediary storage; the space-based archive gives way to a topological place of permanent data transfer. The archives transforms from storage-space to storage-time; only ephemerally it can deal with streaming data in electronic systems. Archival records lose their spatial immobility the moment when they are provided with a truly temporal index which is not applied externally like the "time stamp" in early video recording, but from within the signal space itself, its "data", literally. In closed circuits of networks, the ultimate criterion for the archive - its separatedness from actual operativity - is not given any more. The essential feature of networked computing is its dynamic operativity. Cyperspace is an intersection of mobile elements, which can be transferred by a series of algorithmic operations. In electronic digital media, the classical practice of - so to say - "eternal" storage is being replaced by dynamical movements "on the fly" as a new quality. Classical archival memory has never been interactive, whereas documents in networked space become time-critical to user feed-back.

Media archives in its strict meaning are nothing but spatial repositories of source codes, circuit diagrams, related textual documents and manuals. But different from the archival "record" in the conventional sense, there is the depository of electro-mechanic and electronic machines themselves, and audio-visual records (in the signal-storing sense), which are themselves "time objects" (Husserl), taking place in time, below the scriptural metadata regime. Auditive and visual media are phenomenologically addressing humans on the existential level of their temporal sense. They re-generate temporal experience, thus addressing the human on the sensory (aisthetical, physiological) level as radically present, while human cognition puts it into a so-called "historical" context. Thereby, a dissonance takes place, a gap opens, a *différent* in Immanel Kant's, or more recently, Jean-François Lyotard's sense.

[From space-based to time-critical archives]

With the increasing digitization of traditional material records, archives are becoming time-critical. As opposed to the procedures in the institutional archive, the time it takes for access to records in the electronic archive shrinks to a momentary flash. The traditional archive gets deconstructed by the implications of "online" access. Since antiquity and the Renaissance, mnemotechnical storage has linked memory to space. Nowadays the residential archive as permanence gets replaced by intermediary storage. A drama with an epistemological dimension takes place: the transformation of the classical, datacarrier-based, material storage-"archive" into an archive in agorithmic motion, in electromagnetic ephemerality and latency.

While the traditional archival format and architectural space ensures the persistance of a certain records taxonomy, the new archival order is radically temporalized, ephemeral, even recursive. New kinds of search engines[189] not only answer the desire for new ways of access to digitised or born digital records, but develop into an dynamically renewed art of the archive itself in terms of cybernetic reasoning. According to Von Bertalanffy's cybernetic approach, there are insistent regularities or invariances which *govern* (in terms of feedback-loops) the operative communication of a system with its environment, maintaining a steady state.[190] This corresponds with a dynamic "online" user culture which is less concerned with records for eternity but with order by fluctuation - based on the brute fact that any digital calculation is clocked, derived from a crystal quarz timer from within the mother board of computers. The diagram of data processing within microprocessors (with all its command registers, program counters, buffers for intermediary number storage et al.) immediately displays the different quality of the techno-archive when compared with the traditional archive: It is radically time-biased.

Audiovisual memory: the moving archive

Only with the arrival of chrono-photography (Muybridge, Marey) and with cinematography an impossible dream came true: to catch the dynamic element in movement, the kinetic. Technical media (both for acoustic and visual movements) have created a new kind of archiv(e-)ability.

Whereas the scripture-based classical archive is a static array of records

189 For Constant's *Active Archive*, see Geoff Cox / Nicolas Malevé / Michael Murtaugh, Archiving the Databody: Human and Nonhuman Agency in the Documents of Erkki Kurenniemi, in: Joasia Krysa / Jussi Parikka (eds.), Writing and Unwriting (Media) Art History. Erkki Kurenniemi in 2048, Cambridge, Mass. (MIT Press) 2015, 125-141
190 See Ludwig von Bertalanffy, General Systems Theory, New York (George Braziller) 1968

on the grand scale and letters on the microscale, which could be brought in motion only by the act of human reading line by line, the Edison phonograph at first glance looks like the first form of "archive in motion", since its recording and re-play is based on a continuously rotating, technically moved apparatus, parallel to discrete recording and projection in mechanical cinematography.

One of the ealiest application of sound film for ethnomusical research, a recording of the oral poet Avdo Medejowitch in former Yugoslavia by Milman Parry and Albert Lord around 1935. The archival way of preserving such cultural memory has been the transcription of oral poetry so far, as still practiced by Béla Bartók when transcribing the phonographic records into a musical score (with himself being literally the medium of analog-to-digital conversion, coupled inbetween the Edison phonograph and the paper).

But only when the original media record is being preserved, unexpected new computer-based ways of interpreting the event on its acoustic level can be applied[191] - an information which is lost in transcription, such as the bodily noise (f. e. Avdo's sudden coffing) which helps to answer the question whether the temporal rhythm of a sung stanza is more an effect of bodily economy (breathing), of cognitive notions, or of neuro-physiological embodiments of a time-window called presence.[192]

Technical Acceleration: Temporalizing Archival Space

The traditional remoteness and secrecy of archival records implodes once their digital *doppelgänger* become electronically coupled "online" to Internet-based access. The "residual time of the digital archive shrinks to nil"[193] - almost. More or less immobile cultural materialities of memory (books in libraries, material artefacts in museums, medieval parchment in record archives) lose their heterotopic and heterochronic quality of resistance against the technologocentristic desire for immediacy. Media-ironically, the archive reoccurs, but this time from within: Records from the Internet, during transmission and downloading, dissolve into micro-archival moments which only exist temporally: compressed files

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191 See Meinhard Müller / Peter Grosche / Frans Wiering, Automated analysis of perfomrance variations in folk song recordings, in: Proceedings of the International Conference on Multimedia Information Retrieval (MIR'10), Philadelphia, Pennsylvania, 247-256, 2010

192 See Fred Turner / Ernst Pöppel, The neural lyre. Poetic meter, the brain, and time, in: Poetry (August 1983), 277-309

193 "Die Residualzeit des digitalen Archivs schrumpft gegen Null." Hans Ulrich Reck, Metamorphosen der Archive / Probleme digitaler Erinnerung, in: Metamorphosen. Gedächtnismedien im Computerzeitalter, ed. Götz-Lothar Darsow, Stuttgart / Bad Cannstatt (Frommann-Holzboog) 2000, 221

(appropriately to be "unarchived" from ZIP files for reading after download) and *cache*-buffered frames for streaming video.

Intermediary storage technologies become an integral part of present data circulation and processing; the present itself transforms into a short-time intermediary memory. Central to the success of streaming media (digital audio, video) are the algorithm (codecs) which run their compression and decompression.

Archives (or rather virtual libraries) of sound and moving images, in the age of YouTube and UbuWeb, themselves get in motion.[194] The age of increasing mobility becomes almost incommensurable with the immobile archive in its "katechontic" virtue. In ephemeral electronics, "memory is transitory."[195] Archival resistance against change is a cultural value in the time of networked documents which dissolve into memory-buffered *streaming data*. What resists such *online* acceleration is the very materiality of archival records.

There is an archival counter-resistance against dynamically unlocked "digital memory" indeed. Random Access "Memory" is a technical institution for temporary storage: data waiting for (re-)circulation. This dynamic chrono-logics incorporates the essence of late capitalist time management, which is manifest in the operating system of current computers. On the contrary, the traditional archive *suspends* records from their immediate circulation in the present, as kind of neg-entropic resistance against the imperative global data mobilisation, a bracketing (*epoché*) as suspense from acceleration.

From spatial to time-based archives

What the French historian Michel de Certeau used to call "l'espace de l'archive" becomes radically temporalized. Read with Marshall Mcluhan, this is due to the fact that archives and libraries change from the "Gutenberg galaxy" to the electric, or to be more precise: the electronic age where streaming itself is both the technical condition and the phenomenon of archival information.

From a media-archeological point of view, the traditional archive (as indicated above) gets deconstructed by the implications of digital techniques. Since antiquity and the Renaissance, mnemotechnical storage has linked memory to space. But nowadays the static residential archive as permanent storage is being replaced by dynamic temporal

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194 See Ekekhard Knörer, Trainingseffekte. Arbeiten mit YouTube und UbuWeb, in: Zeitschrift für Medienwissenschaft vol. 5, no. 2 / 2011, 163-166

195 Vannevar Bush, As We May Think, in: Atlantic Monthly, July 1945, xxx

storage, the time-based archive as a topological place of permanent data transfer. Critically the archives transforms from storage-space to storage-time. The archival data lose their spatial immobility at the moment when they are being provided with a truly temporal index (literally *dated*). In closed circuits of networks, the ultimate criterion for the archiv - its separatedness from actual operativity - is not given any more. The essential feature of networked computing is its dynamic operativity. Cyperspace is an intersection of mobile elements, which can be transfered by a series of algorithmic operations. In electronic, digital media, the classical practice of quasi-eternal storage is being replaced by dynamical movements "on the fly" as a new quality. Classical archival memory has never been interactive, whereas documents in networked space become time-critical to user feed-back.

Database art (George Legrady)

Following Marshall McLuhan, let us describe media art as an "early warning system" of ongoing changes in media culture. Current media art displays a hightened sensibility for temporal and time-cricital processes taking place in media as opposed to traditional, museum- or archive-orientated forms of expression.

The read-only-memory of the archive is currently being replaced by operational archival interaction, as illustrated by *Pockets Full of Memories*, an online and museum installation by the media artist George Legrady in which the audience *creates* an archive by contributing a digitized image of an objekt in their possession at the time of the exhibition visit. Interaction is an aspect Bertolt Brecht pointed at already in the 20s for the emerging medium radio, insisting that it can technically - on the (feed-)back channel - be used in a bi-directional way as well by the receivers to communicate instead of being unilaterally being distributed as broadcast.[196] The unidirectional communication of books still dominated the user experience. With different *hierarchives*, a network is not a text any more, rather an archi(ve)-tecture. As long as the key-board of computers is alphabet-based like a type-writer for printing just letters, the paradigm of printing remains dominant; progressively though the mouse-click replaces the key-board for directing the monitor, and orientation shifts to visually perceived information landscapes; in multi-media space, however, the act of re-activating the archive can be dynamically coupled with feedback.

The hybrid "classification" in self-organizing maps as applied by Legrady is that it translates both keywords (semantic information) which can be manually tagged by the human contributors and the algorithmized object

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196 Bertolt Brecht, Der Rundfunkt als Kommunikationsapparat, in: Gesammelte Schriften, vol. 18, Frankfurt/M. 1967, 117-134

description, and turns them into numbers; this is how the mathematically determined organization happens. "Many of the other metadata also influence the location, for instance, the date, possibly the object's origins, I now forget what else."[197]

In his more recent, technologically up-dated version called *Cell Tango*, George Legrady (with Angus Forbes) displays an installation (projection) of constantly changing cellphone photos (sent by individuals to pix@celltango.org), projected rhythmically over a large, black screen in a variety of patterns. Fresh snapshops swiftly adjust to that mosaic according for formal criteria (image-based matching) and according to their tags (meta-data), thus mingling with photos taken from Flickr (the photo-sharing website). A gap between the visually associative and the linguistically semantic field opens - retrieval based on similarities (like in Renaissance curiosity cabinets) rather than on archival or library classification.[198]

In one of the four modalities of the installation, "Cell_Bin", first the most recent images are placed on the black screen, and an algorithms randomly distributes them. The space left inbetween is successively filled by smaller incoming photographies. Loosely coupled patterns evolve dynamically; this form of media art is called Database art "in which infomation is the artist's main medium"[199]. Legrady collects the ephemera of everyday life and databases them it in a rather associative than rigid way, combined with a cognitive influence by user tagging - a hybrid of intuitive (aesthetic) and cognitive classification.

This, of course, is different from a stricly ruled-governed classical archival structure. In fact, the archive derived its authority from the "veto" against permanent change, such like a book which is meant to last for decades is a rock of enduring textuality against the permanent up-dating of Wikipedia articles. Dynamic interaction between reader/user/visitor and the database is one thing; the resistance of a body of knowledge against permanent re-constellation is another (the task of libraries and museums and archives).

"The images arise and disappear in a hypnotic rhythm. Tags come up in groups, in a kind of free association. Images that you wouldn't think belong together somehow link up, leading the viewer down strange [...] pathways", The Boston Globe review comments. This is a contemporary, dynamical version of the rather spatial modernist aesthetics of montage (cut-up) and collage: close to Vannevar Bush's 1945 vision of a Memory

197 George Legrady, electronic communication 29th July 2010
198 See www.suchbilder.de: pixel sorting at work according to colour affinity
199 George Fifield, director of Boston Cyberarts Inc., quoted in: "Can you see me now?", report on the Wellesley College installation, in: The Boston Globe; http://www.wellesley.edu/DavisMuseum/exhibitions/exhibitions_celltango.html, accessed August 2010

Extender (which by Theodor Holm Nelson was developed into the the Hypertext practice). But the basis of this artful archive is still an algorithm, the Self-Organizing Map (SOM) once developed by Teuvo Kohonen - which represents the mathematized archive. Let us have a close look: archive(s) with and without "s". In French, Michel Foucault's use of the word *archive* in the singular is not idiomatic; the institutional archive is always a *plurale tantum* "archives". *L'archive*, Foucault's singular, has a different meaning: the prediscursive condition of something to be articulated at all. For the case of the Internet, this is the communication protocols.[200] Central for finally archivizing *streaming media* are the codecs which compress digital media formats (like sound and moving image) - the archive of motion in its algorithmic sense.

From space-based to time-based archives

While the traditional archive of predominantly textual records provides a spatial order, to be transformed into "history" by the very act of writing, the audio-visual archives themselves take place in time, beyond the scriptural regime.

AV media address humans at the existential sensation of being which is the temporal sense. They re-generate temporal experience, thus adressing the human on the sensory (aisthetical, physiological) level as radically present, while the intellectual mind puts it into a "historical" context: here, a dissonance takes place, a gap opens*.*

Media archaeologists describe the non-discursive practices of the techno-cultural archive. Media phenomenologists analyze how phenomena in various media appear to the human cognitive apparatus, "that is, to the mind and senses"[201]. Roland Barthes' notorious identification of the two disctinct qualities of photography when under analysis by humans, the *studium* (the rational contextualization) and the *punctum* (the touching affect time-tunneling the difference between past and present) can be applied to archival times as well. While the media-archaeological reading of the archive is biased by the technomathematical analysis (the techno-*studium*), not mistaking storage for remembrance, the phenomenological reading of the archive corresponds with the *punctum* when miracolously something like a flash crossing and short-circuiting the temporal gap between the record from the past and its present reading happens.

200 Alexander Galloway, Protocol. How Control Exits after Decentralization, Cambridge, Mass. / London (MIT) 2004
201 Kjetil Jakobsen, Anarchival Society, 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)

From archival statistics (memory) to stochastic time series analysis (dynamic remembrance)

The transformation of the classical, datacarrier-based, material storage-"archive" into an "e-motional" archive in electronic motion, in electromagnetic ephemerality and latency, has an epistemological dimension. The gain of flexibily and computability is paid with a loss of durability.

When recently the Cologne Municipal Archive materially collapsed, it became apparent that most records, though being dirty and mutilated, materially survived this catastrophe, astonishingly resistabe agains the pressure of stones. In a similar way the first-generation ("analogue") audiovisual storage media turned out to be surprisingly resistant against temporal entropy (like the Edison-cylinder and grammphone records, as well as daguerreotypes, photographic negatives and film on celluloid). More delicate is the destiny of cultural memory based on electromagnetic storage; digital media, finally, tend to divest themselves completely from their material embedding - loosing the "touch ground" by getting technically "virtual".

Traditional physical storage media (whether with spatial or with temporal "bias" in the sense of Harold Innis) have been orientated towards being literally inscribed (*graphein* in its old Greek sense): "There must be a writing means by which the information to be stored is introduced into the device."[202] Electromechanical storage media, with the latency of their recorded signals, take place in a sphere which is different from the scriptural regime of the classical archive - a regime which, on the level of alphanumeric codes, unexpectedly returned within techno-mathematical machines.

Adapting and modifying Marshall McLuhan's major theses on media culture, the message of the traditional storage agency "archive" is the typographic world of alphabetic records (the symbolic ORDER of administration), with the discreteness of elementary units privileging analytic reading and classificatory listing. Both as inscription in stone and on paper reigns the alphabetically induced combinatorial aesthetics of collage, cut-up, actually opposed to the electronically induced aesthetics of flow (the streaming archive). But with the concept of a dynamic, relational archive, a problem remains. How can the archive be opened to "heterochronic" experimentation and at the same time fulfil its traditional task of keeping a well-defined order intact for transmission into future memory?

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202 Ira M. Sage, Making Machines Remember, in: Product Engineering, Bd. XXIV (April 1953), 141-149 (141)

What is new in the so-called digital age, is the radical temporalization not only of the archival records themselves but of its archival infrastructure (called hardware and software) as well. So the traditional "space" of archive itself becomes a function of temporal change, requiring a differential analysis.

Different from the traditional script-based institutional archive, the multimedia archive (as organized by the internet) becomes radically temporalized. It is rather hypertemporal than hyperspatial, being based on the aesthetic of immediate feedback, recycling and refresh rather than on the ideal of locked-away storage for eternity. The aesthetics of recycling, sampling and cultural jamming is a direct function of the opening / the openness / the online-availability of (multimedia) archives.

Contrary to the traditional occidental culture of knowledge storage and transmission, the age of electric media generated what the art world spotted as "Fluxus", literally: the flow. Instead of managing static words and images, Fluxus interprets life primarily in "musical" terms of overlayed waves, resonances, changing patterns.

What looks like a static electronic video or TV image, is in fact a dynamic event, unfolding waves in micro-time. Does "the archive in motion" lead to Fluxus Arc, to the floating archive? The video artist Bill Viola in 1973 created a video installation with 20 minutes of just visual noise. But this highly improbable flimmering of electrons on the screen, according to the mathematical theory of communication as developed by Claude Shannon in 1948 as the basis of all our today media communication systems, contains the highest degree of possible surprise; that is why Viola calls his piece *Information*.

The most informative archive is the one which does not produce what its researcher is looking for exactly.

Two archival tempor(e)alities

Archives emerged with writing. The symbolical code can be transmitted (now "migrated") with a high degree of fidelity in copying, regardless the variable material support. Any alphabet is mostly invariant towards historical, i. e. entropical time. When digital data count as "information", *per definitionem* (Norbert Wiener) they are primarily neither matter nor energy.[203]

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203 See Rudolf Gschwind / Lukas Rotenthaler (interviewed by Ute Holl), Migration der Daten, Analyse der Bilder, Persistente Archive, in: Zeitschrift für Medienwissenschaft 2, 1/2010, 103-111 (104)

Documentary science has developed the notion of "logical preservation"[204]. "*Prentice Hall's Illustrated Dictionary of Computing* (Nader 1992: 412) irreversibly severs the material link by noting that 'software is independent of the carrier used for transport'."[205] But the Floppy Disc as a material support for the software is itself a hint to the material link. Any information must take place in or on a material support (storage medium), which introduces another, different tempor(e)ality: entropy.

If past media records are not just symbolically emulated, their temporal (entropic) qualities must be archivized as well - like the scratch, the noise of an ancient Edison phonographic cylinder when being digitized.

With an ancient phonographic record, the media archaeological ear listens to the noise of the recording device as well (the ancient wax cylinder) besides the recorded voice or music. Here, the medium talks both on the level of enunciation and of reference: message (the formerly recorded songs) *and* noise (the wax cylinder scratch and groove).

Archival resistance once more: monumentality as *epoché*

With its massive going *online* the archive loses its traditional power: its *secrecy*, its informative temporal difference to the immediate usage and consumption in the presence.

What if the Norwegian public will rather use Google than the internet portal of the National Library or the Europeana portal to get access and information on Norwegian memory? Will WWW, Web.2 and the emerging Realtime Net replace the traditional guardians of memory (archives, libraries) like Internet radio and IP-TV is about to replace the traditional broadcasting of information media?

Archival endurance is undermined when a record is not fixed any more on a permanent storage medium but takes places electronically; flow replaces the inscription. All of the sudden, an archival virtue might be - counterstrategically - archival resistance against complete mobility. The archive should stay both inside and outside the "Web 2.0" economies; both opening archival services and defending archival secrecy (the *arcanum*).

The so-called real-time Internet is a set of technologies and practices which enable users to receive information as soon as it is issued, rather

204 Hans-Joergen Marker, Data Conservation at a Traditional Data Archive, in: Edward Higgs (ed.), History and Electronic Artefacts, Oxford (Clarendon Press) 1998, 294-303 (296)
205 Doron Swade, Preserving Software in an Object-Centered Culture, in: ibid., 195-206 (195)

than requiring that they check a source periodically for updates.[206] Among this figures *instant messaging*; in McLuhan's sense, notwithstanding its semantic content, the message of the communication medium here is: immediacy. With all that getting-in-motion of the traditional archive, it may now (as a retro-effect) rediscover its virtue as institutional monument: to take out data values from the ever accelerating circulation and electronic economy, to arrest and fix and maintain chosen items, thus turning floating records (documents, files) into monuments (in Foucault's sense[207]), into spatio-temporal chronotopes (Michail Bachtin), *epoché* as sublation, taken out of time.

DATA, "UNDEAD": Exorcising the cultural prosopopoietics of the archive and other archival phantasms

Archivology of Media

Ephemeral articulations like speech and sound, movement and the instant moment have, as it were, become immortally archivable by technical media of recording like photography, phonograph, and film. But the relationship established between the classical archive (as an institution of processing textually coded records for memory) and such media of recording is a just metaphorical one. Such machines are for engineers what rhetoric is for the humanities. What results from a culture of non-discursive apparatuses is, on a discursive level, an epistemological aesthetics based on the figure of prosopopoietics, the desire to address the dead as something alive. Media-archaeology teaches to unmask this archival phantasm as a *mis*understanding of technical media. Media archivology - both subject and object of analysis - uncovers the hidden rhetorical trope which still governs the cultural phantasm of hallucinating speech and life in what is actually mute and mechanically dead; only after its exorcism, the media archive emerges which creates relationships not in the narrative frame of causes and effects, beginning and end, but through hardware circuitry and software networks.

Re-presencing the past by signal recording: the "undead"

Dynamic processes in their temporal real can not be narrated, but simply registered by technical media.[208] As opposed to the historiographic, that is: symbolic timing of history, storage time is empty time.[209] What looks

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206 http://en.wikipedia.org/wiki/Real-time_web, accessed January 20, 2010
207 "Introduction" to his *Archaeology of Knowledge*
208 Quoted after: Gabriele Seitz, Film als Rezeptionsform von Literatur, 2nd. ed. Munich (tuduv) 1981, 413
209 „Das Konstrukt 'geschichtlicher Zeit', eines geschichtlichen Kontinuums ist untrennbar verknüpft mit dem Medium des Buches [...] Demgegenüber ist

live to the beholder in visual media, might as well be recorded from tape (since the introduction of magnetic TV recording in 1958/59) - an uncanny, undeadly state of the moving image. "We must be informed whether or not what we are seeing is "live". [...] we cannot distinguish through our senses alone between what we take to be simply "alive" and what as reproduction, separted from its origin, is structurally posthumous [...]."[210]

As illuminated by René Descartes in his non-metaphorical comparison of the human body with a clock-work, the "undead" undoes the binary logic of life and death.[211] Already the emergence of the phonograph puzzled clear distinctions between absence of the past and sonic presence.[212] "Speech", as it were, has become immortal", reads the comment of the *Scientific American* from 1877 on Thomas Alva Edison´s recent invention. *Nota bene*: "as it were". Since such machines are for engineers, what figures of speech are for writers. What returns here, epistemologically, is the figur of prosopopy, the rhetoric of presenting the dead as alive - just like the first advertising images of the Edison phonograph presented the apparatus as growing out of an allegorical human figure. The 19th century is full with phantasies of making the dead sent decipherable messages to the living, such as the experiments with magnetic writing tables to see such messages appear.[213]

What had been a rhetorical figure so far, became positive evidence in the electro-physiological experiments of Duchenne de Boulogne in his 1862 publikation *Mécanisme de la physiognomie humaine*, where he describes the phantasm of self-registering life, when the moment electric current, sent through human flesh, is being coupled with photographic registration.[214] Subject of Duchenne´s experiments has been a patient suffering from the Moebius desease, whose mimetic facial muscles (the *nervus facialis*) had been lame from the time of his birth. Such a face,

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Speicherzeit *leere oder tote Zeit*": Götz Großklaus, Medien-Zeit, Medien-Raum: zum Wandel der raumzeitlichen Wahrnhemung in der Moderne, Frankfurt/M. (Suhrkamp) 1995, 47
210 Weber 1996: 121
211 René Descartes, Über die Leidenschaften der Seele, in: Philosophische Werke, trans. and commented by Artur Buchenau, Leipzig (Meiner) 1911, chapter 6 "Über den Unterschied eines lebendigen und eines toten Körpers",
212 See David Kaufmann, Der Phonograph und die Blinden, 1899
213 One of these tables has been recently detected by a researcher of the journal *Natural History* in the archive of the Society for Psychic Research at Cambridge University, with still readable ghost-writing. See Richard Milner, Charles Darwin and Associates, Ghostbusters, in: Scientific American, Oktober 1996
214 See Hans-Christian von Herrmann / Bernhard Siegert, Beseelte Statuen - zuckende Leichen. Medien der Verlebendigung vor und nach Guillaume Benjamin Duchenne, in: Kaleidoskopien. Jahrbuch des Instituts für Theaterwissenschaften der Universität Leipzig, Jg. 3: Körperinformationen, Institut für Buchkunst Leipzig 2000, 65-99 (92)

devoid of expression and motion - as if he had put on "a lifeless mask of himself "[215] - is the reversal of archival prosopopy indeed, re-poled like the "+" and "-" in electric circuits itself. The *v-* or *compufrog* has transferred this scenario into the pure space of digital calculation.[216] The artificial life of electro-informaticized machines, in their contemporary generation, have become a function of their "deep learning", reacting by self-modifying algorithms on incoming „sensual" data.[217]

It is the option of feedback-operations, given with integrated circuits, which sets the classical storage medium archive - a „trivial machine" in the terms of Heinz von Foerster's cybernetics[218] In mathematical terms (Markov chains), the awareness of a past state of a machine influences the probability of its future actions.

The virtual reactivation of a lost sound storage medium: Hornbostel´s *Phonogramm-Archiv*

Recently, the silence of data has been dissimulated by linguistic (ro)*bots* in cyberspace; algorithms make websites literally speak to the user. Even if the dead can still not be interviewed interactively with a microphone, there is a memory of their recorded voice now. The notion of the archive is in transition - towards the audio-visual, resulting in unforseen options of retrieval under new media conditions - transcending the conventional notion of the archive itself.

In the same year as Sigmund Freud fixed his psycho-analytic interpretation of dreams (*Traumdeutung*, 1900), the psychologist of acoustic phenomena, Carl Stumpf, and in his sequence the music ethnologist Erich Moritz von Hornbostel, founded, at the Berlin university, a phonographic archive with world-wide recordings on wax-cylinder of the voices of people threatened to be extinguished.[219] At the end of the 20th century the archival character of von Hornbostel´s phonogram archive has been reversed: The "frozen" voices on the analogue,

215 Jan Schweizer, Mienen in Fesseln, in: Die Zeit no. 2 from 4th January 2001, 25f

216 See Burkhard, Strassmann, Frösche mit der Maus retten, in: Die Zeit Nr. 1 v. 28. Dezember 2000: 58, referring to: www.george.lbl.gov/vfrog (Lawrence Berkeley National Laboratory, University of California), and the morphological program *Compufrog* (www.kmr.net/bluecross)

217 Dirk Baecker, Was wollen die Roboter?, in: Carl Hegemann (ed.), Freude ohne Ende. Kapitalismus und Depression II. Berlin (Alexander) 2000, 134-152 (139)

218 See Heinz von Foerster, Prinzipien der Selbstorganisation im sozialen und betriebswirtschaftlichen Bereich, in: ders., Wissen und Gewissen. Versuch einer Brücke, Frankfurt/M. (Suhrkamp) 1993, 233-268

219 See Artur Simon (ed.), Das Berliner Phonogramm-Archiv 1900-2000. Sammlungen der traditionellen Musik der Welt, Berlin (VWB) 2000

vulnerable storage medium of Edison cylinders are currently defrozen by digital means. The Berlin Society for the Enhancement of Applied Informatics has developed a method to gain acoustic signals from negative traces of galvano-copies from Edison-cylinders by opto-endoscopic „reading" - scanning visual information into sound.[220] Thus the making of stored acoustic frequencies actually speak does not ask for rhetoric operations, but on the contrary a hermeneutically distant gaze, an exteriority of interpretation which the aesthetics of the opto-technical scanner only can provide.[221] Technical media provide a different option of reading without (premature) understanding.

Thereby one can listen again to the recordings taken by the ethnologist M. Selenka who went to the tribe of the Wedda in India in 1907. She made the natives speak or sing into a phonograph which she instantaneoulsy played back to the speakers - to their joyfully recognition.[222] With the media mystery of the recordability of the physically real of sound and images, humans are confronted with their multi-media mirror effect (in Lacan´s sense), sublating the clear-cut difference between presence and absence, present and past. Strange enough, we are able, today, to listen to this play-back in exactly the same quality as the Indian natives could in 1907, since an example of the above mentioned opto-eletronic archaeology of sound can be appropriately experienced right in the World Wide Web. Message or noise? Only the media-archaeological operation of opto-digitally reading the inscribed traces make the otherwise unaccessible sound recording audible again. Synesthetically, we can *see* a spectrographic image of sound memory - a straight look into the archive.[223] The opto-digital *close reading* of sound as image, though, dissolves any semantically meaningful unit into discrete blocks of signals. Instead of musicological hermeneutics, the media-archaeological gaze is required here.

At the end of Second World War, the reels of a secret medical film project from between 1941 and 1945 at the Berlin hospital Charité were thrown by the SS into lake Stössensee near Berlin when the Red Army approached the capital. It was a literally media-archaeological moment when divers detected these films in 1993 and rescued them; just three of several hundred film rolls could be deciphered at all, one of them showing on the basis of heavily damaged film material the shape of a naked man who performs several movements, apparently directed by

220 See Gerd Stanke / Thomas Kessler, in: Simon (ed.) 2000: 209-215
221 Siehe Jeffrey Sconce, The voice from the void. Wireless, modernity and the distant dead, in: International journal of Cultural studies Vol. 1, no. 2 (1998), 211-232
222 Quoted after: Max Wertheimer, Musik der Wedda, in: Sammelbände der Internationalen Musikgesellschaft, vol. XI, no. 2 (1910), 300-309 (300)
223 See the spectrogram of a reconstructed recording of Wedda chants in Ceylon 1907 on the SpuBiTo web page http://www.gfai.de/projekte/spubito/index.htm

orders from outside. "More cannot be seen, comments the media artist who has re-presented this material to the public[224] - a ghostly media-prosopopy.

Every film is, always already, itself an archive of time-as-movements, of life as process in time which cannot be reproduced, only measured in moving-image form.[225] The pioneer of cinematographic *montage* in Russia, Wsewolod Illarionowitsch Pudowkin, produced a film together with the Leningrad researcher of behavioural patterns Pawlow in 1928 under the title of *Functions of the Brain* and comments on the articifiality of mechanic reproduction of life: Any movement shown by filmic projection is dead already, even if its original has once moved in front of the camera. Only the setting-in-relation of filmic moments by cutting them together into a visual synthesis provides them with „filmic life".

Technological *prosopopeia*

The kernel behind the historicist impulse "to speak with the dead" is a cultural technique: the archaic Greek modification of the Phenicean commercial writing system into the phonetic alphabet by adding single letters for vowels in order to record the musicality of oral poetry - the textual *grammophone* not *avant*, but *avec la lettre*.[226] Written letters, though, inevitably belong to the realm of the symbolic which is the order of the archive, as different from physically indexial traces - the immediacy of the real like rays of light on photography or tracks of sound on recordings. Such technical memories are archives or libraries no more.

A coupling between the rhetoric of prosopopy and technics already takes place in Sigmund Freud´s comparison of psychical latency "with a photographic shot [...], which might, after a given temporal delay, might be developed into a positive image"[227].

The American painter Elihu Vedder (1836-1923) once drew the subject of *Questioning the Sphinx* (1863).[228] The postmodern painter Marc Tansey has given Vedder´s image a literally media-archaeological turn, by

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224 Christoph Keller, Lost / Unfound: Archives As Objects As Monuments, in: catalogue *ars viva 00/01 - Kunst und Wissenschaft* for the exhibition by prizewinning artists of Kulturkreis der deutschen Wirtschaft im Bundesverband der Deutschen Industrie e. V., Berlin (Staatliche Galerie Moritzburg / Halle, January - March 2000); transl. Jeanne Haunschild, Berlin 2000
225 W. Wicker, 1964, as quoted in: Keller 2000
226 Barry Powell, Homer and the Invention of the Greek Alphabet, xxx
227 Sigmund Freud, Der Mann Moses und die monotheistische Religion III, paragraph "Latenz und Tradition", in: idem, Studienausgabe, vol. IX, Frankfurt / M. (S. Fischer) 1989, 455-584 (571)
228 See the exhibition catalogue: Ägyptomanie. Ägypten in der europäischen Kunst 1730-1930, Electa xxx, entry no. 180, 262 f.

privoding the interrogator of the Sphinx with a microphone - with the option not only to listen to the dead, but as well to record this evidence. Electronic recording is the techno-fiction of reversing death; with the invention of the grammophone voice has lost its logocentristic priviledge of authorizing true presence. In Walter Rathenau´s novel *Resurrection Co.* the administration of a cemetery in the city Necropolis, Dacota/USA, after some scandalous cases of mistaken people buried still alive established a company called „Dacota and Central Resurrection Telephone and Bell Co.“ with the aim of connecting the buried with the public telephone network - just in case.[229]

The silence of the archive

Both readers and historians long for making a textual body resound again - what has theatrically been called *re-enactment* by Collingwood. Jules Michelet, historian of the French Revolution, hallucinated the murmurs of the dead in the archives, as if archival records had always been the logocentric variance of a phonogram (*avant la lettre*): "Dans les galeries solitaires des Archives où j'errai vingt années, dans ce profond silence, des murmures cependant venaient à mon oreille."[230] The present multi-mediatic interface aesthetics of computers makes use of this prosopopoietic desire. The media-archaeological resistance to this techno-ideology of dialogue with data though rather looks at the signal-to-noise-ratio of electronic data transfer, from the point of view of communication theory which Foucault recognized in his 1966 essay „Méssage ou bruit?“, reminding us that „Freud a fait des énoncés verbaux des malades, consideérés jusque´là comme bruit, quelque chose qui devait être traité comme un message.“[231] Today, Foucault´s own recorded voice can be listened at on a CD-ROM. But here, human ears only, not the technical apparatus, make sense out of noise. What was once called cultural tradition is technical transmission of signals today. Digital video streams are compressed in order to make them storable and transmittable at all. While in the transmission of archived text in the occidental tradition every letter counts - for a discipline called philology -, by compressing and decompressing digital images subtle amounts of data are being lost. This might be almost undetectable for the weak human eye or ear (MP3) - organs which have been deceived in its perception since the origin of time-based media like film and phonography -, but in the world of military target calculation one bit of difference might lead to lethal errors.

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229 As reported in Friedrich Kittler, Gramophon - Film - Typewriter, Berlin (Brinkmann & Bose) 1987, 23

230 Jules Michelet, Histoire de France, preface of 1869, 24, in: Oeuvres Complètes IV, edited by Paul Viallaneix, Paris (Flammarion) 1974

231 Michel Foucault, Message ou bruit?, in: Concours médical, 88ᵉ année, 22 octobre 1966, 6285 f.; reprinted in: idem, Dits et Écrits I, Paris (Gallimard) 1994, 557-560 (559)

Very titanically: So what happens to the archive?

The recent (re)search for the wrack of the ocean liner *Titanic* has been a true act of submarine archaeology. While the gaze of the camera is able to look at this archaeologically (that is, purely evidentially in the sense of remotely sensing data), the human eye though immediately confounds evidence with magic when it comes to re-presentation of the absence of the past. "Out of the darkness, like a ghostly apparition, the bow of a ship appears [...] just as it landed eighty-four years ago." When the submarine exploration device *Mir 1* set out for the search of the wrack in 1995 late-summer, limited visibility and strong currents were a constant threat to the expedition. Film director James Cameron recollects: "Initially, I had totally superimposed my vision on to the ship and made the mistake of not letting *Titanic* talk to me. I was like the astronauts who experienced the moon as a series of checklists and mission protocols" - which is truly media-archaeological perception. Cameron counter-reacted: "So, at a certain point I abondoned "the plan" and allowed the emotional part of my mind to engage with the ship."[232] When the *archaeology of data knowledge* is submerged in historical imagination, hermeneutic empathy replaces data navigation distance. Sonar echoing in submarine archaeology is transformed into empathetic *resonance*. The submaritime ruinscape (relics from the ground of the sea) is transformed into narrative in Cameron's film *Titantic*.[233] The real archival item, though, is the non-figurative board-register, containing the record of all orders, like the black box in an airo-plane as the most non-narrative evidence of human and technical enunciations.

The prosopopoietic rhetoric of the archive is currently being replaced by operational archival interaction, as illustrated by *Pockets Full of Memories*, an online and museum installation by the media artist George Legrady in which the audience *creates* an archive by contributing a digitized image of an objekt in their possession at the time of the exhibition visit. Interaction is an aspect Bertolt Brecht pointed at already in the 20s for the emerging medium radio, insisting that it can technically - on the (feed-)back channel - be used in a bi-directional way as well by the receivers to communicate instead of being unilaterally being distributed as broadcast.[234] The unidirectional communication of books still dominated the user experience. With different *hierarchives*, a network is not a text any more, rather an archi(ve)-tecture. As long as the key-board of computers is alphabet-based like a type-writer for printing just letters, the paradigm of printing remains dominant;

232 Joel Avirom / Jason Snyder, James Cameron's Titanic, foreword by James Cameron, New York (Harper Perennial) o. J., xii
233 USA, Twentieth Century Fox, 1997
234 Bertolt Brecht, Der Rundfunk als Kommunikationsapparat, in: Gesammelte Schriften, vol. 18, Frankfurt / M. 1967, 117-134

progressively though the mouse-click replaces the key-board for directing the monitor, and orientation shifts to visually perceived information landscapes; in multi-media space, however, the act of re-activating the archive can be dynamically coupled with feedback. This does not lead to a return of rhetorically prosopopoietic intercourse with the digital archive, but rather is this figuration in space being dynamically replaced by figures in time. David Gelernter points at the data flow called *lifestream* as a future alternative to the current desktop-metaphor of computer interfaces which still carry, with file-like icons, an anachronistic archivism dating from old-European times of secretaries and offices. Instead of rethinking digital storage space in its own terms (the language of computing), there is still *stacks*, *files* and *registers*).[235] If emphatic memory (data permanently stored on hard-disks) is being replaced by a future of the computer as a place of intermediary, *passing storage*, the digital medium becomes „a mere temporary holding tank for data, not as a permanent file cabinet".[236] Future, present and past then are but segments, functions of marking differences within the transitive data stream. This leads to a performative consequence as well. Is it possible to avoid simply writing *about* the archive, thus missing the archival mode of representation itself, by writing the archive transitively? The option thus is to represent the archive as loosely coupled medium, not as historiographically closed form; this nonnarrative mode means to count (with) what is *given*: *data*.

PARA-ARCHIVAL DATASCAPES

Since the Internet is transversive communication[237], its memory does not endure[238] but rather consists of a series of temporal units, with the archival paradigm being replaced by (algo-)rhythmic transfer.

Within the notion of cyberspace, „space" itself is already a metaphor for something which might rather be described in topolocigal, mathematical-geometrical terms. *Cyberspace* is not a new place (*locus*) of memory, but the transformation of *lieux de mémoire* into knots and nets of data transfer. While still being infrastructurally grounded in physical places and techniques, the virtual adresses exist in mathematical topologies only.[239]

235 A media archaeoly of the file has been written by Cornelia Vismann, Akten. Medientechnik und Recht, Frankfurt/M. (Fischer) 2000
236 David Gelernter, Machine Beauty. Elegance and the Heart of Technology, New York (Basic Books) 1997, 106
237 See Pierre Lévy, Cyberkultur. Universalität ohne Totalität, in: telepolis. Die Zeitschrift der Netzkultur Nr. 0, Bollmann Verlag, Mannheim 1996
238 Christoph Drösser, Ein verhängnisvolles Erbe, in: Die Zeit, 23th June 1995, 66
239 See Albert Lichtblau, „Cyberspatial Monuments of Memory", 234ff, in: Gerfried Stocker / Christine Schöpf (Hrsg.), Memesis. The Future of Evolution,

With supremacy of selection over storage, addressability over sorting, archival terminology - or rather the archive itself - becomes literally *metaphorical* - a function of *transfer* processes. From location to pure address: „Only what has been stored can be located" - rather *vice versa*.[240] In this sense the Internet generates a „new culture of memory, in which memory is no longer located in specific sites or accessible according to traditional mnemonics, and is no longer a stock to which it is necessary to gain access, with all the hierarchi<vi>cal controls that this entails."[241] The matter of memory becomes an effect of techniques of recall. "The debates around the future development of WWW centre on the issue of whether the web is simply a technique of recall from a global archive, or whether it marks the beginnings of a new, inventive relationship to knowledge, a relationship that is dissolving the hierarchy associated with the archive" (ibid.).

As a machinic network of finite automata (a kind of techno-rhizome) the Internet does not provide for an organized memory; there is no central automat. The Internet is being defined by the circulation of discrete states only.[242] Thus the net is conform with radical constructivism in philosophy: Phenomena are always being created actually, but not as permanent or storable entities.

The Internet *as* archive at all?

The term "archive" is properly applied to legal and administrative memory institutions, but this should be differentiated from storage media. "The possibility of using a hypertext network as a universal archive is a dramatic development."[243] But does such a net fulfill the criteria of an archive proper, and second, is such a network of archival value as such? The servers of *archive.org* (located at the University of Berkeley) undertake the memorization of the Internet as represented in websites, but the Internet is rather about links than about storage. "Das

Wien / New York (Springer) 1996
240 Harriet Bradley, The seductions of the archive: voices lost and found, in: History of the Human Sciences Vol. 12 No. 2 (1999), 107-122 (113)
241 Howard Caygill, Meno and the Internet: between memory and the archive, in: History of the Human Sciences Vol. 12 No. 2 (1999), 1-11 (10). See Lisa Jevbrett's visualization of the Internet by a coloured array of its fabric of IP-addresses.
242 Gilles Deleuze / Félix Guattari, Tausend Plateaus. Kapitalismus und Schizophrenie, a. d. Frz. v. Gabriele Rick / Ronald Vouillié, Berlin (Merve) 1992, 31 u. 36
243 Theodor H. Nelson, Computer Lib - Dream Machines [*1974], Redmont, Wash. (Tempus Books) 1987, 33

Internet ist nicht *per se* archivierungswürdig. Das Internet ist auch kein Archiv im Verständnis von ArchivarInnen."[244]

The primary effort of conventional archival labour is separation and exclusion rather than storage: "La question est de savoir quoi trier et quoi abondonner."[245] The Internet as well still orders knowledge: apparently without providing it with irreversible hierarchies any more (on the visible surface), but on the other hand the authoritative archive of protocols is more rigid than any traditional archive has ever been. Traffic overload in the computer networks led the Clinton administration to build a new, separtate system - the Internet II, restricted to scientific (and military) communications.

The internet adopts the so-called *chaotic storage* method known from economy: "[T]he World Wide Web and the rest of the Internet constitute a gigantic storehouse of raw information and analysis, the database of all databases. [...] The more serious, longer-range obstacle is that much of the informationon the Internet is quirky, transient and chaotically 'shelved'[246] - *organizational memory* rather than archive in the coventional sense.

Navigating (in) the archive

The archival definition of the basic unit of archives, the *fond*, is an "[e]nsemble de documents, quels que soient leurs formes ou leur support matériel, dont l´accroisement s´est effectué d´une manière organique, automatique, dans l´exercice des activités d´une personne physique ou morale [...] sans jamais le démembrer.[247] The internet "archive", on the contrary, has become radically temporalized. It is rather hypertemporal than hyperspatial. The difference between the classical archive and the Internet is its dynamic, no more just passive option. Such is the use of the term "archive" in the Internet itself, indicating its shift of emphasis on realtime or immediate storage processing, on fast feedback. Hypermail, e. g., has been a program that takes a file of mail messages in UNIX mailbox format and generated a set of cross-referenced HTML documents, so that the entire mail "archive" could be browsed in (literally) "a number" of ways.

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244 Andreas Kellerhals-Maeder, Archive in der schönen, neuen Welt. Auf dem Weg zu einer klaren Position, in: Geschichte und Informatik 12 (2001), 89-108 (95)
245 Farge 1989: 87
246 Editorial: The Internet. Bringing order from chaos, in: Scientific American vol. 276 no 3, march 1997, 494 (49)
247 J. André, De la preuve à l´histoire, les archives en France, in: Traverses 36 (January 1986), 29

There has been a definition of the function of archives in the internet in a narrower, precise meaning: "It was soon realised that each site providing its own anonymous *ftp* area with its won material would make it difficult to find and catalogue the information available. The answer to this problem was to provide archives; machines dedicated to the task of serving files via anonymous *ftp*. These archives collect together material from other anonymous *ftp* areas scattered through the Internet and present it in a single location. The job of the archive maintainers is to keep the archives up-to-date and to try and organise them in an orderly fashion."[248]

With Internet search engines like *Netscape navigator*, hyperspace remembered its essence in the etymological sense: cybernetics, that is: navigation of a ship on the basis of negative feedback steering.[249] With symbolically coded voltage, the „taste of the archive" as described by Arlette Farge has gone: „Elle est difficile dans sa matérialité"[250]; by its organization in logical circuits, it still does not become amorphous. "Celui qui travaille en archives se surprend souvent à évoquer ce voyage en termes de plongée, d´immersion" (ibid.) – a cyberspatial key notion indeed.

The power of archival memory resides not in the stored data, but in the external inventories which make data accessible at all. By making (once digitized) visual memory accessible *from within* (f. e. by search engines like QBIC which strive for image-based image retrieval by sililarity or „query by image content"), a real iconic turn has been achieved. The technical dispositive gains power over the cultural imaginary.

To what degree is the Internet archivable?

Is there a cultural need for digital time-capsulas? The loss of websites from the Internet is symptomatic for the systematic disappearance of digital cultural commodities. "It will take many years before an infrastructure that assures Internet preservation becomes well established"; media archivology attends to the chance to trace an emerging new medium *in statu nascendi*. Otherwise, "the opportunity to capture a record of the birth of a new medium will then be lost"[251] - memorizing the new-born internet in realtime.

The two bodies of Internet memory are both physical and topological. The *Internet Archive* "may provide the raw material for a carefully indexed, searchable library. The logistics of taking a snapshot of the Web

248 "Information and archives on the Internet", http://www.hensa.ac.uk/www94/internet.html
249 See Wiener 1948
250 Farge 1989: 10
251 Kahle 1997: 83

are relatively simple. [...] The software on our computers `crawls´ the Net - downloading documents, called pages, from one site after another. Once a page is captured, the software looks for cross references, or links, to other pages. It uses the Web's hyperlinks - adresses embedded within a document page - to move to other pages."[252]

Archival temporality is fractioned into hardware: „We chose hard-disk storage for a small amount of data that users of the archive are likely to access frequently and a robotic device that mounts and reads tapes automatically for less used information. A disk drive accesses data in an average of 15 milliseconds, whereas tapes require four minutes. Frequently accessed information might be historical documents or a set of URLs no longer in use."[253]

Internet memory becomes differential, in terms of Delta-coding: „We plan to update the information gathered at least every few months. [...] In future passes throught the Web, we will be able to update only the information that has changed since our last perusal" (ibid.). Such an "archive" can only me a selective mapping, a sampling of the Internet (while dynamic objects and the "secret Web" escape). „Still, the archive gives a feel of that the Web looks like during a given period of time even though it does not constitute a full record" (ibid.).

Not only data, but their formats ask for preservation: "The Commission on Preservation and Access in Washington, D.C., researches how to ensure that data are not lost as the standard formats for digital storage media change over the years. In another effort, the Internet Engineering Task Force and other groups have labored on technical standards that give a unique identification name to digital documents. These uniform resource names (URNs) [...] could supplement the URLs that currently access Web documents. Giving a document a URN attempts to ensure that it can be trced after a link disapears" (ibid.).

Dissimulations of the cyberspatial techno-archive: virtual waste land

Internet communication has make the "old European" user accustomed to the shift from a culture of storage to an accelerated notion of "delayed transfer" (a term keyed by Jack Goody).[254] But there is a loss of the katechontic quality of deferral in cyberspace, undoing "tradition".

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252 Brewster Kahle, Preserving the Internet, in: Scientific American, vol. 276, no 3 / March 1997, 82 f. (82)
253 Kahle 1997: 83
254 See Stefan Iglhaut, Vom Archivieren zum Navigieren. Anmerkungen zu `Deep Storage´ und zum Medium der Verfügbarkeit, in: Deep Storage. Arsenale der Erinnerung: Sammeln, Speichern, Archivieren in der Kunst, ed. Ingrid Schaffner / Matthias Winzen, Munich / New York (Prestel) 1997, 174-176

Hardware itself seems to be forgotten in metaphors like "cloud computing". David Gelernter formulates the ultimate goal of all software "to *break free of the computer*, to break free *conceptually*. [...] Cyberspace is unlike any physical space. The gravity that holds the imagination back as we cope with these strange new items is the computer itself, the old-fashioned physical machine. [...] every key step in software history has been a step away from the computer, towards *forgetting* about the machine and its physical structure and limitations – forgetting that it can hold only so many bytes, that its memory is made / of fixed-size cells, that you refer to each cell by a numerical address.[255]

Against the totalizing vision of virtual storage, the Internet might actually reveals its impossibility of being an archive. „Dump your trash" is a call to use the Internet as a virtual copy machine of information recycling[256]; the server *sero.org* helps to turn webpages into a seemingly dusty inscription.[257] The company Imagex has created a machine called *Decopier* which sucks printing out of xeroxes to render an empty page. And a couple of artists have created artificial information deserts and voids in cyberspace indeed, such as Mark Napier (New York) with his project *The Landfill*, turning any content of web-pages into graphical raw material. Once again, aesthetics turns out to be ideological, since it sublimely hides the digital truth behind the interface simulacra. The more radical version, though, is the cookie / program *ArchiVirus* created by Manu Luksch, Arnim Medosch and R. Steckel (to be copied from the internet on one´s own computer. Then it decomposes textual documents on the hard disk into its ingredients; alphabetically sorted, all the letters of a file appear on the screen, sense-less, but as a kind of raw material for composing new texts. This is a kind of *reverse engineering* of the archivo-literary phantasies developed by Leibniz and Jorge Luis Borges, from letters to litter.

GOOD-BYE, "ARCHIVE". Towards a media theory of dynamic storage

The topic of the "archive" as memory agency and its intersection with visual arts, photography, film, sound, literature and philosophy has been academically and aesthetically exhausted in the last years. The ever-present "archive" has become much of a metaphorical umbrella term for all kinds of memory, while in theoretical writings, Foucault's use of the term *l'archive* has been frequently confused with the institutional state archives. The "archival fever"[258] in the cultural field has become inflationatory, and many artistic projects which proudly call themselves

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255 David Gelernter, Machine Beauty, New York (BasicBooks) 1997, 22 f.
256 Joachim Blank / Karlheinz Jeron, Information-Recycling, in: netz.kunst. Jahrbuch für moderne Kunst 1998/99, Nürnberg 1999, 92-99
257 See Baumgärtel 2000: 178

"archive" are rather idiosyncratic collections; finally, the term "anarchive" has been liberating but obscuring as well. The phenomenon of the "archival turn" is the symptom of a nostalgic, even melancholic reaction-formation (in Freudean terminology) of traditional memory culture which is confronted with the challenge of contemporary media: technological storage (both "big data" and ephemeral micro-storage), different from the "library", the "museum", and individual or collective "memory". To face this challenge, most advanced algorithmic approaches are required.

There has been a well-developed terminology restricted to archival science, bureaucracy, and administration which resists metaphoric transfer. The challenge is how to re-define or replace familiar cultural memory agencies like archive, library, museum, by more precise technological terms. One of the reasons for misunderstanding the term "archive" as metaphor is due to Michel Foucault's idiosyncratic redefinition of *l'archive* in a chapter of his *L'Archéologie de Savoir* (1969) which should not be confused with French *les archives* as legal term for an institution in state bureaucracy. In a rather propositional sense (therefore closer to logical and mathematical diagramatic reasoning than to cultural memory) *l'archive* here is first of all the rule of what can be expressed at all, that is: the system that governs the appearance of statements as individual events, and corresponding to that definition, "archivology" is the analysis of diverse relationships and the identification of their specific regularities - which is algorithms in the computational present. The condition of possibility in media culture (Immanuel Kant's *a priori* in its technological understanding) can neither be reduced to the material nor to the intellectual; the contemporary conditions of media culture is rather infrastructure than archive[259], an interlacing of material channels with the logistical, in fact: symbolic order (software, replacing the older notion of "library"). If the *archive* is the ensemble of techno-logical conditions of possiblities, this pre-structuring "before" takes place in hardware *and* in logical control (software). In a more radical techno-mathematical sense: the algorithm *is* the machine (Turing). For the analysis of dynamic storage technologies which defines the always micro-delayed computational present, the category of the archive even becomes a hindrance; expressions like the "archive in motion"[260] sound poetic but are an oxymoron when observed strictly. For an archivology of contemporary media culture which is computer-algorithmic in its operational essence, a close mathematical reading is mandatory - therefore the claim for radical, non-nostalgic media archaeology.

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258 Jacques Derrida, Archive Fever. Freudian Impression, in: Diacritics vol, 25 (1995), 9-63
259 See Lisa Parks / Nicole Starosielski (eds.), Signal Traffic. Critical Studies of Media Infrastructures, Urbana / Chicago / Springfield (Univ. of Illinois Pr.) 2015
260 Eivind Rossaak (ed.), The Archive in Motion, Oslo (Novus) 2010

While there is actual obsolescence in media materialities, there is no obsolescence in the principles (*archai*) of technology; hardware degradation (the physical "archive") is redeemed by logical preservation.[261] Does a truly archival record require to be read or just preserved? A trifold essence of the digital record unfolds: It is physically inscribed as meaningless signal, logical when recognized and processed by software (the algorithmic grammar), and media-phenomenologically "conceptual" only when recognized by humans and / or socio-economic systems. "The rules that govern the logical object"[262] - Foucault's definition of *l'archive* - are independent of how the data are written on a physical medium (which means invariant over time) as long as the code is known. In such readability, technological scanning itself has already intervened.

Operative memory from within technology: Dynamic storage

The symbolical order of the institutional archive should neither be confuse with human neuronal recollection, nor with technological storage. Still, digital micro-memory architectures, its topology and organisation, preserves some habits of traditional archival and administrative practice - such as the pre-archival *registers* in the heart of the Arithmetic and Logical Unit of a microprocessor, as the intermediary and volatile repository of current acts. This corresponds with the echoic memory of the operative present within the human brain, once resulting in the famour cybernetic epistemology of the "computer brain" (McCulloch, Pitts, Wiener). The "register"merges both areas which have been discursively separated into one operational horizon, by including the storage elements *immediately* into the current action and the action of the electric current. The electrons themselves do not remember.

Updating "the archive"

"Radical" media archaeology (in alliance with "digital forensics"[263]) is rooted in logified matter which means electronic assemblages and electric circuitry on the material matter, and algorithmic code as the symbolic machine. "*Arkhe* [...] names at once the *commencement* and the *commandment*."[264] In operative technologies, this *arkhe* is not abstract but locatable in temporal and material action. Techno-logified

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261 See Doron Swade, Collecting Software: Preserving Information in an Object-Centred Culture, in: History and Computing Vol. 4 No 3 (1992), 206-210
262 Kenneth Thibodeau, Overview of Technological Approaches to Digital Preservation and Challenges in Coming Years; http://www.clir/pubs/reports/pub107/thibodeau.html (accessed May 2017)
263 See Matthew Kirschenbaum, Mechanisms. New Media and the Forensic Imagination, Cambridge, MA (The MIT Press) 2008
264 Derrida 1995: 9

matter (hard- and software) constitutes a nondiscursive *archive* in Foucault's sense; its being is not simply subject to cultural discourse when the material and mathematical *veto* intervenes. In Foucault's distinctive usage of the term *archive*, "the archive cannot be described in its totality", since the observer himself is still part of that archive.[265] The describability of the technological *archive* only arises when its practices start to recede into the past. The complex algorithms of the Google search engine, as long as they are *archive* in the technological, not bureaucratic sense of "protected mode", remain mainly inaccessible.

A concept of "the archive's two bodies"[266]

Already in its traditional sense, the "archive" has been a term both for an architecture (hardware) and a rule for processing of records (filing). The administrative archive in the strict sense is a read-only memory; neither the record nor the archival order as such (its "tectonics") can be easily changed according to a new discursive will. Just like within computing, a rewriting of code in the operating system would make the whole function collaps. It is the nonnarrative structure of the archive which makes it such a uniquely powerful institution. The order of records in the administrative archive is tightly coupled by its metadata and rarely open for modification; active intervention is stricty forbidden. Therefore the avantgardistic concept of an *active archive* is oxymoronic; once archival records are renegotiated and updated[267], there is no more archive at all. There is a solution to this dilemma: The physical record (even the "digitally born" file respectively its archivally preserved "disc image") remains strictly untouched, while its digital *double* invites for all kind of knowledge-based algorithmic experimentation.

No anarchy in the digital archive

In computer-networked culture, digital data processing is still rigorously rooted in its techno-mathematical structure. It is tempting to call this media infrastructure an "archive", as long as this term is meant in Foucault's sense of material discourse analysis. But in academic discourse, the analytic distinction between then Foucauldean and the institutional archive has failed; instead there is a rather fuzzy applications of "archival" terminology.

For critical reasons, the inflational metaphorical misuse of the "archive" for memory agencies might be limited. Updating the archive, in digital

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265 Michel Foucault, Archaeology of Knowledge [FO 1969], trans. A. M. Sheridan Smith, New York (Pantheon Books) 1972, 130
266 Alluding to Ernst H. Kantorowicz, The King's Two Bodies, Princeton 1957
267 Cox et al. 2015: 127

culture, means, a separation of cultural discourse from "the archive". The term can be replaced by more precise *termini technici* when it comes to the technological "a priori" in hard- and software. Media *archivology* proposes a metonymic shift in which the technological devices themselves *are* the archive, an operative rather than historicizing agency. It can process discourse since it is in itself nondiscursive, not negotiable unless by re-wiring or re-programming.

"The media archive is as much about archiving recordings as it is about storing machines."[268] But technology does not archive but store signals (respectively data). "And the latter, the configuration of the storing of the machines, is also configuring our future access to the archive"[269] - which means access to technological data carriers in the sense of storage location addresses "not memory (or 'history')"[270]. Archival authenticity becomes nonhuman. For technological storage in computing, the term "memory" has been a metaphorical application by engineers, once written explicitly in quotation marks. Before John von Neumann's *First Draft* "conflated the computer with the biological metaphor of memory, computing devices were envisioned as 'storage' devices"[271]. Only diagrammatically, but not technologically "like an archive", a computer memory is both what is temporally stored and its location. An archive is a cultural technique, whereas technological "memory" is storage of a different kind.

Case Kurenniemi

While in public discourse the archive is frequently (mis-)understood as the "content" of the archive (its records, its data banks), in archival science the term rather refers to the organizing structure. Therefore items of the technological *archive* (in Foucault's sense) can in fact be traditionally administered by a traditional archive as instition, like media artist Erkki Kurenniemi's textual, audio and video record(ing)s. In the Finnish National Gallery's Archives, Library and Collections section at Helsinki, his estate is predeposited since 2006. "Kurenniemi himself would probably call his archive not an archive, but a database [...] not to be used for studying the life of Erkki Kurenniemi but for accessing his perceptions and consciousness [...]."[272] It is nonhuman knowledge which is preserved here in the media channel: "In the case of the voice diaries recorded on cassettes, it is often impossible to distinguish noise from

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268 Morten Sondergaard, Interfaces of Future Authenticity, in: Joasia Krysa / Jussi Parikka (eds.), Writing and Unwriting (Media) Art History. Erkki Kurenniemi in 2048, Cambridge, Mass. (MIT Press) 2015, 191-202 (195)
269 Ibid.
270 Sondergaard 2015: 196
271 Sondergaard ibid., referring to Wendy Hui Kyong Chun, Programmed Visions: Software and Memory, Cambridge, MA (MIT Press) 2011, 8
272 Susanna Paasonen, Fleshy Intensities, in: Krysa / Parikka (eds.) 2015: 33

information (Kurenniemi's own voice, radio shows, music, and ambient background sounds are all heard). [...] many of the digital videos shot with 1990s mobile phones have notably poor image quality and sound resolution to the degree that the audiovisual 'data' are barely accessible. The balance and ratio between the signal and noise is contantly unsteady [...]."[273] What is required for the memory of the present age is a media archaeological theory of tradition which encompasses both cultural and noncultural messages of such kind.

"Entropic" media memories

"The quantity which uniquely meets the [...] requirements that one sets up for `information´ turns out to be exactly that which is known in thermodynamics as *entropy*. [...] In the physical sciences, the entropy associated with a situation is a measure of the degree of randomness [...]; and the tendency of physical systems to become less and less organized [...] gives time its arrow - which would reveal to us, for example, whether a movie of the physical world is being run forward or backward."[274] The video *Entropia* by Andreas Müller-Pohle shows the destruction of photographies by a shredding machine. Negentropic digital coding, on the contrary, persists againsts such entropic material decay, and roots within the mathematical theory of communication engineering itself. The digital code ows its ahistoricity rather to its different form of registering; instead of straightforward signals recording of the physically real event, signals are sampled and encoded which symbolically keep the information. This information is suspended from physical time, leading to memory latency. Foucault's *l'archive* thereby recedes into the coding and protocol, the truly media-*arché*ological (in fact media-archivological) layer of communication.

Different from analogue storage media which entropically fade away with time (like the baroque allegories of transient time - "tempus fugit"), digital memory - due to its address structure - has a binary character not only in its elementary units but overall: It is either fully available, or gone"; on / off here does not correlate with the emphatic notions of cultural time any more, which is still based on the chrono-aesthetics of smooth transitions. In most cases, "digitally saved information can either be read without loss of quality, or it is illegible and hence 'completely lost'"[275].

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273 Ibid.
274 Warren Weaver, Recent Contributions to the Mathematical Theory of Communication, in: Claude E. Shannon / same author, The Mathematical Theory of Communication, Urbana, Ill. (University of Illinois Press) [*1949] 1963, 1-28
275 Gschwind 2006: 184. See as well Timothy Scott Barker, Time and the Digital. Connecting Technology, Aesthetics, and a process Philosophy of Time, Hannover, New Hampshire (Darmouth College Press) 2012

Dynamics *within* memory devices: the "enduring ephemeral"?[276]

If "memory [...] is just the intersection of mind and matter", as expressed in Henri Bergson's *Matter and Memory*[277], then *digital* memory can be located where the informatinal *lógos* actually becomes a a technical scene. The core of digital random access memory is the single storage element with its smallest unit being a flip-flop, a binary unit to store or change one bit of information, or a dynamic charge device which constantly needs to be refreshed. The core experience in cultural modernism which is perpetual change, corresponds to a shift of emphasis in *actual* archival memory - the transitory file (as part of present administration) gains supremacy agains the enduring record; *acta* are provided with a functional vector of immediacy, they are meant to be *activised.*[278] The archi(ve)texture of technological administration is better conceived in processual rather than structural terms.

Rather detached from its former almost exlcusive orientation towards state bureaucracy, archival sorting and preservation of administrative records is being replaced by the incremental date of arrival (*numerus currens*) as a pure series. As inventory technique, the so-called *accession principle,* in numerical sequence, links a file to the actual address space of data. The assignment of such addresses is vital for the operations of "memory" in digital computing as data-storage.

The archive does not contain "historic" memory (which is shaped only in historiography), but spatially configured storage. The technical *archive* is not a place for the conservation of a memory content from the past; media archaeology rather discovers its techno-archival *message*. The temporal bias of the archive shifts, in times of predictive analytics by NSA dataveillance, shifts from past to *futurum exactum*. "[T]he technical structure of the *archiving* archive also determines the structure of the *archivable* content even in its very coming into existence and in its relationship to the future."[279]

A radical archaeology of media follows Foucault's *Archaeology of Knowledge* in reconstructing the generative matrix created by technical and logical dispositivs. Athanasius Kircher's term for his machine for automatically composing music (as discussed in Zielinski's *Media*

276 See Wendy Chun, The Enduring Ephemeral, or The Future Is a Memory, in: Erkki Huhtamo / Jussi Parikka (eds.), Media Archaeology. Approaches, Applications, and Implications, Berkeley / Los Angeles / London (University of California Press) 2011, 184-203
277 trans. N. M. Paul / W. S. Palmer, New York (Zone Books) 1991, 13
278 On German *Akte* vs. *Urkunde* see Cornelia Vismann, Akten. Medientechnik und Recht, Frankfurt / M. 2000
279 Derrida, 1995: 17

Archaeology) has not by coincidence been named "arca", a term which has been used as well as the old name for "archive" - a Foucauldean use of the term *avant la lettre*, referring to the generative set of rules and material mechanisms (the "active archive") which produce the musical impression (like programming in a software called SuperCollider today, algorithmic compositions). Computer programming, the cultural force of today, is non-narrative in favor of algorithmic forms of writing - an alternative form of minimal, serial time-writing (rather registering), close to the paradigm of computing itself.

The archive of contemporary digital culture is techno-mathematics (algorithms, microchip circuit diagrams); therefore media *archivology* is exploring the techno-logical archive: its material and logical operations. Its media-theoretical language is *archeographical* by using transitive expression, close to the machine; re-translating (re-"compiling") machine language into verbal code, like the *disassembly* operation in computer-"textual" forensics: electro-magnetically reading out, e. g. from an obsolete computer game, bit charges in program memory (ROM chips). Assembly code is the *logos* of computational *arché*. *Media archaeology* inquires such "prehistories of technological media. Here, the prefix "pre-" does not refer to a "before" in its temporal or geological sense, but rather to a structural pre-condition.

Towards a medium-specific theory of technologies: Storage as media channel

In favor of a genuinely media-specific theory of memory technologies, storage must be strictly defined as media channel. The dynamics *within* memory devices deserves close description to reveal its potential for a refreshed terminology of "memory", even of "time".

Dynamic micro-media memories induce a cultural shift of emphasis from permanent storage to restless transfer. With the aesthetics of *re:load*, the affinity between the archival operation and cybernetics turns out, resulting in feedback memory and timeshifting.

What makes a theory of storage a media theory is Claude Shannon's very definition of the communication channel itself which he called "merely the *medium*" (1948). Storage may be redefined as suspended value of transmission, as slowed-down ("cooled") transmission within a channel.

Different from analog electronic media (culminating in radio and television "live" broadcasting which is based on time-critical signal transmission), with digital communication technologies, an irreducible micro-moment of intermediary storage is involved - memory not in its culturally emphatic, but in its sense of processing the present.

Among the five elements of Shannon's mathematical theory of communication ranges the transmitter which transduces the message (a selection per unit of time from an "alphabet" of possible messages in the information source) *via* modulation (in the analogue channel case) or suitable coding into a technical signal - "something which is quite impossible in the discrete case without intermediate data storage"[280]. Even if the proper "medium" in Shannon's diagram is a *memoryless channel* (with the output signal being a direct function of the input signal without processing inbetween), the digital variance with its compression algorithms puts emphasis on the intermediary memory momentum.

Intermediary storage in forms of signal delay has been already applied in high-electronic systems like colour TV (system PAL, as indicated by its acronym); even the phenomena of magnetic hysteresis and remanence might be taken into account.[281] Signal delay lines might be called a micro-memory. But such intermediary memories are not of a logical, calculating nature like the intermediary storage of bit values in registers of Central Processing Units in computing. Every digital *sampling* of time-continuous signal events in the physically real world must first convert the signal in time- and value-discrete signals which micro-techno-mathematically is most generally be performed by the "sample-and-hold" mechanism involving a micro-memory operation: a temporal delay (catechontically deferring the momentary time-value) at the borderline of becoming "memory" as storage.

The temp*aura*lity of archival storage

Walter Benjamin defined the *aura* as peculiar interlacing of time and space - "einmalige Erscheinung einer Ferne, so nahe sie sein mag".[282] The archival *aura* in this sense does not simply emanate from its air of secrecy and power-relation; it stems from a specific temporality as well, in fact: its temp*aura*lity. The archival temp*aurality* which used to be based on the indexial trace from the past (the Barthean *punctum* in analog photography) is being replaced by nonlinear time-critical, even bit-critical operations (like the Charged Coupled Device as basis for digital photography nowadays).

Photography, literally understood as a photonic emanation of an object, memorizes rays of light to the viewer in the present - a delayed transfer of what otherwise would have vanished into the dark. This inscribes

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280 Friedrich Kittler, The History of Communication Media, in: online journal www.ctheory.net/articles.aspx?id=45; published 7/30/1996
281 For methods to clear magnetic data remanence see the entry "Degaussing", http://en.wikipedia.org, accessed April 7, 2014
282 Walter Benjamin, Kleine Geschichte der Photographie, in: idem, Gesammelte Schriften, eds. Rolf Tiedemann / Hermann Schweppenhäuser, Frankfurt/M. (Suhrkamp) 2nd ed. 1989, 368-385 (378)

physical tempor(e)ality into the image. In addition, Marey's and Muybridge's chronophotography then apparently recorded temporal movement itself - but the discrete (in its double sense) archival essence of technical cinematography is mostly hidden to human perception which favours continuous motion.

With the informatisation of archival documents, they loose their physical, material characteristics (the "taste" of the archive, in Arlette Farges sense[283]) in favor of a standardized electronic immediacy with no appeal of distance at all any more. Digital memory looses its temp*aurality*.

The present as a function of memory

Within the temporal window of what humans perceive as "the present", real time signal-to-data processing happens subliminally. Time-critical memorization takes place in the neuronal net, representing a kind of dynamic micro-storage for moments. Both neurological perception and digital culture turn are radically memory-based, even if such memory shrinks to ephemeral short-term storage.

The actual "state" of a discrete physical system (in accordance with Turing's machine concept) is always already a memory since it involves recorded information, just like a flipflop circuit represents the smallest electro-technical storagte unit for a "bit".

In *Matiére et Mémoire* (1896), Henri Bergson expressed that memory does not go back from present to past, but in reverse, a recall of images takes place in the short-cut between immediate perception and virtually stored perception from the past. Thus dynamical recollection (remembrance) is closer to the electronic image than to the archival order.[284] Digital devices - different from live transmission in electronic media like analog radio and television - are based on micro-memories indeed (be it registers, flags, "cache", et al.). Not only that memory becomes part of the present, but the present itself dissolves into microarchival and micromnemotechnical moments.

With programmable media, remembrance (as defined by Platon and more specifically by Aristotle as *anamnesis*[285]) is not exclusively human any more, but becomes a (Latourean) non-human agency - algorithmic memory.[286] The term "algorithmic" is used here in its widest sense: a)

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283 Arlette Farge, Le goût de l'archive, Paris 1989
284 See Maurizio Lazzarato. Videophilosophie, Berlin (b_books) 2002
285 Aristotle, Peri mnemes kai anamneseos, as part of the *Parva naturalia* in: Aristotle, vol. VIII: On Soul, Parva Naturalia, On Breath, Cambridge, Mass. / London 1986
286 See Katrina Sluis, Algorithmic Memory? Machinic Vision and Database Culture, in: New Media and the Politics of Online Communities, ed. by Aris

operations based on the Indian-Arabic use of numbers, and b) a rule-governed notational solving of a given problem by its sequential analysis (and synthesis in reverse) in single steps.

Generic memory replaces the fixed record, like in digital image compression an image is not transferred in its entirety but algorithmically compressed and condensed to be regenerated. Even more radical (in the epistemological sense) are "virtual" media, that is: any object that exists not by indexical reference to an origin in the physical world like chemical photography or phonographically recorded sound, but is generated genuinely by calculation. The virtual archival record is not preserved in its materiality on which its traditional authority has been based, but is regenerated on demand - just like Leon Battista Alberti in the early Italian Renaissance invented a numerical procedure for reproducing the map of Rome without loss in the act of copying.[287] The rules (i. e. algorithms) of such regeneration are the new *archive* (French writing) in Foucault's neologistic sense, the conditions of a possible actualization at any time. This actualization is a form of temporal existence which dramatically differs from the physical recall of a material record.[288] Knowledge and memory in the Gutenberg era, once trusted to an official publication ("Imprimatur!") or to the archive, claimed to be (in principle) time-invariant. With the fluidity of electronic publishing and online access, though, stored records becomes dynamically updatable an any temporal instant.

Once the coded message is trusted to a storage medium, it is suspended and locked in an almost atemporal state. Symbolically coded memory has a good chance to be transmitted with high fidelity against noise, like alphabetic letters are, to a high degree, resistant against entropic degradation since they can be copied ("refreshed") within a broad range of individual variance. "The quality of the medium is of secondary importance, as long as the 'code' can still be decoded."[289] From that results a rather ahistoric form of tradition, different from the scratchy audio signal as phonographic record or the "stealthy disintegration due to the relatively low stability of photographic material"[290].

From archival space to storage time

Mousoutzanis / Daneil Riha, Oxford (Inter-Disciplinary Press) 2010 (in eBook format), 227-236

287 See Mario Carpo, Alphabet und Algorithmus. Wie das Digitale die Architektur herausfordert, Bielefeld (transcript) 2012, 72-76

288 Carpo 2012: 144

289 Rudolf Gschwind, Digitisation and Long Term Archival of Digital Data, in: Lioba Reddeker (ed.), Gegenwart dokumentieren / Archiving the Present, Vienna (Eigenverlag basis wien) 2006, 183-195 (185)

290 Gschwind 2006: 183

Archives have long been the institutional basis for remembering and forgetting in societies across history[291], but as a description of technological storage the archive as metaphor fails. The archival itself has become part of the current crisis of memory terms. A shift of emphasis has occurred from archival space to archival time, owing to the dynamics of computational data transfer. For cyber"space" (which, against this metaphor, is rather a mathematical graph, an operative diagram) the notion of the archive has already become anachronistic; it rather requires to be described in terms of a hard-wired temporality, replacing emphatic memory by temporary storage, and reverberative transfer.

Discrete temporal intervals are embodied in the para-archival mechanism built into the transfer process of data in the Internet as such. Once messages have been fragmented into data packets, they are disseminated to find the most effective routes in the net composed by a grid of servers world-wide. This flood would block the Internet very soon unless there was its Time To Live (TTL) stamp. The existence of data packets has the *being-to-death* (Heidegger) value of 255 (according to 8 bit logic). With each passage across a server relays (a "hop"), the value decreases at one. If this amounts to zero without the data packet having arrived as its destined address, it is being deleted.[292]

Micro-processors in data processing assign intermediary storage locations to current data and provide them with addresses; the "digital present" in *online* data communication is never in the "now" but always already computationally delayed. Any transmission of signals in digital networks (different from "live" analog media broadcasting) needs to be coded. In both its electrophysical infrastructure and its metadata (transfer protocols) the Internet is *l'archive* in a technical radicalization of Foucault's definition, but in terms of its content, the Internet is just ephemeral storage and transfer no "archive" in the familiar institutional sense at all.

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291 Andrew Hoskins, Media, Memory, Metaphor: Remembering and the Connective Turn, Parallax 17:4 (2011), 19-31 (25), chapter "Space, Time, Archive"

292 See Martin Warnke, Digitale Archive, in: Hedwig Pompe / Leander Scholz (eds.), Archivprozesse. Die Kommunikation der Aufbewahrung, Cologne (DuMont) 2002