

[ON ARCHIVES]

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(Neg-)Entropy and dis/order in times of binary information processing

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## RADICALLY DE-METAPHORIZING THE ARCHIVE

### **Archival tempor(e)alities**

- primary archival task: decisions about non-memorization of current records; company Imagex has created a machine called *Decopier* which sucks printing out of xeroxes to render an empty page
- *online* communication of records widens the gap to traditional archives: residential, static memories contrasted by dynamical, temporal forms of storage in streaming media where e. g. video can be consumed *while* its data transfer; clear "archival" distinction between downloading first and screening second dissolves into micro-buffering of single frames "on the fly" *alias* realtime
- "Lifestreams system", replacing the desktop metaphor, "treats your own private computer as a mere temporary holding tank for data, not as a permanent file cabinet" = David Gelernter, *Machine Beauty. Elegance and the Heart of Technology*, New York (Basic Books) 1997, 106
- highest degree of disorder (entropy), which contains, in communication theory, the highest degree of (possible) information
- simultaneous arrangement of files allows for jumps to other addresses like in digital computer storage. Synchronisation replaces the historical discourse here, leading to an aesthetics of many pasts folded into the present in latency
- techno-archival temporalities can be identified as *chronopoetic* once they are not passive storage but dynamically driven by algorithms which finally affect the human sense of time
- search engines like Google can be efficient in real-time only by creating intermediary "archives" of indexed Web sites and up-dating them in high frequency. In combination with such intermediary storage, predictive analytics in digital communication surveillance allows to anticipate immediate future events by stochastic mathematics (the figure of "futurum exactum" familiar in grammar)
- eliminate human "bias" in the process of making decisions and recommendations: "Spotify strives to be entirely data driven. [...] Decisions that cannot be made by data alone are meticulously tracked and fed back into the system so future decisions can be based off of it. [...] Sounds robotic, but humans cannot be trusted [...]": Jason Palmer, "Analytics at Spotify," Spotify Labs, May 13, 2013, accessed June 28, 2016, <https://labs.spotify.com/2013/05/13/analytics-at-spotify>
- message of the traditional storage agency "archive" = typographic world of alphabetic records (the symbolic ORDER of administration), with the

discreetness of elementary units privileging analytic reading and classificatory listing; (re-)turn within digital computing (alphanumeric code / algorithms)

- "bias" originally a technical term in electronic engineering describing the necessary electric tension to operate a vacuum tube (esp. triode) - a literally pre-conditioning, a ground tension for making the circuitry work at all, an electric (thus truly media-archaeological) *a priori*; current electronically biased use of the term archive, "online data collections labeled archives could in fact be better characterized as perpetual transmission rather than permanent storage"<sup>1</sup>. What used to be "secret" spaces secluded from public insight - the *arcana* of administration, their archival memory, now directly wired to the communication circuit of the present; archive loses its temporal exclusivity as a space remote from the immediate present (access); "katechontic" counter-aesthetics usually associated with the archive. But archives of movement, in the age of YouTube and UbuWeb, themselves get in motion<sup>2</sup>; networked documents dissolve into memory-buffered *streaming data*

- intermediary, temporary storage (RAM) waiting for (re-)circulation belongs to the logic of late capitalism and thus is part of a memory economy. In a contrary way, a virtue of the traditional archive has been exactly that it was outside (historical) time, kind of archival resistance against complete mobility; suspense (*epoché*) from the temporal economy

### **From spatial archives to time-based platforms**

- residential memories such as archives are being replaced by dynamical, temporal forms of storage in digital space - which replaces storage by transfer - literally, "metaphor"

- static archival memory differs from dynamic documents in virtual space which can be automatically up-dated (truly "dated"). Tracerouters not spatial, but temporal scouts; within the digital regime, all data become subject to realtime processing. "Aus der Perspektive der Realzeit kann man also sagen, dass Vergangenheit nur eine Täuschung ist"<sup>3</sup>

- dynamic temporal storage, data recycling. Classical archival memory has never been interactive, whereas documents in networked space become time-critical to user feed-back; sequentializing, time-critical, synchronous communication

### **From location to addressability**

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1 Frank Kessler / Mikro Tobias Schäfer, Navigating YouTube: Constituting a Hybrid Information Management System, in: Snickars / Vonderau (eds.) 2009: 275-292 (276)

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

3 Semir Zeki, Farbe, Form, Bewegung - Zur Verarbeitung des visuellen Wissens im menschlichen Gehirn, in: Weltwissen / Wissenswelt, ed. Christa Maar / Hans Ulrich Obrist / Ernst Pöppel, Cologne (DuMont) 2000, 170-174 (171)

- mis-considered as an "archive", Internet has not yet even arrived at its own memory mediality. Cyberspace is a transversive performance of communication (Pierre Lévy<sup>4</sup>); thus "cyberspace has no memory"<sup>5</sup>. Only data which are provided with addressable metadata can be accessed in the cultural archive; 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 is being replaced by a limited series of temporal entities. Space becomes temporalized, with the archival paradigm being replaced by permanent transfer, recycling memory.

- what can be (alpha-)numerically addressed can be located in the (techno-)symbolic order. 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.“<sup>6</sup> 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. When the indication of temporal "access" data becomes the dominant feature in Internet research, the traditional archival order liquifies, defreezes: "Informational goods require access, not possession."<sup>7</sup> The *networked storage model* turns electronic archives into a generative agency; the traditional classificatory indexing (by meta-data) is replaced by dynamic (thugh still rule-governed, protocol-governed) sorting.<sup>8</sup> The archival does not reside in the content of its files, but in logistic cybernetics (the cyberarchive which is the object of "media archivology". When *parallel distributed processing* in computers replaces traditional *computer memory*, data become rather temporally that spatially locatable. Considered as „une opération technique“ (Michel de Certeau), the archive becomes a cybernetical memory machine, a play of data-latency and data-actualization, retentions and protentions of the present. As long as documents remain within the reach of actual administrations, they are part of a powerful regime. Within the digital regime, all data become subject to realtime processing. Under data processing conditions in realtime, the past itself becomes a delusion; the residual time delay of archival information shrinks to null.

- linked to the Internet rather than to traditional state bureaucracies, organizational memory has become circulating states, constructive rather than re-constructive. After digitization, media memory is not bound to specific materialities any more (like the photographic print, the film roll, or the gramophone record and video tape), but becomes a function of applied algorithms as techniques of recall (retrieval). The networked data bases mark

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<sup>4</sup> Pierre Lévy, *L' intelligence collective*, pour une anthropologie du cyberspace, Paris, Ed. De la Découverte, 1995

<sup>5</sup> Christoph Drösser, Ein verhängnisvolles Erbe, in: *Die Zeit*, 23th June 1995, 66

<sup>6</sup> 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)

<sup>7</sup> N. Katherine Hayles, *Coding the Signifier: Rethinking Processes of Signification in Digital Media*. Lecture at Humboldt-University Berlin, 11 May 2001

<sup>8</sup> See Elena Esposito, *Soziales Vergessen. Formen und Medien des Gedächtnisses der Gesellschaft*, Frankfurt/M. (Suhrkamp) 2002, 43; as well Alexander Galloway, *Protocol*, MIT 2004

the beginning of a relationship to memory that dissolves the hierarchy associated with the classical archive.

## **Data migration**

- institutionally the "archive" still an administrative and juridical memory of state or other corporations; in computational culture an *arché* of a different kind has emerged: a generative, algorithmic, protocol-like agency, literally *programmatic*; its relation to the physical world is defined by sampling. Already the traditional, text-based archive consists of digital elements, elementary letters of the alphabet. But in the digital age, the alphabet is reduced to a binary code which, in the von-Neumann-architecture of the computer, does not separate stored data and the processing rules any more (like in traditional archives, where the files are kept in magazines while the archival rules of procedures are kept in books or administrative meta-documents). When both data and the procedures are being 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.

- 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 economy of information = the unexpected) - literally "bit-mapping", mapping (by) bits. Since 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). Towards the generative archive, the archival paradigm, in genuinely digital culture, is being replaced by sampling - the direct random access to signals

## AURA AND TEMPORALITY: THE INSISTANCE OF THE ARCHIVE

### **Between passive container and active mediator: the archive**

- *insistence* of the "archive" in spite of the "anarchival impulse" declared in media art; the *instance* of the "archive" as a regulating law in digital technologies, and finally the *instant* of "the archive" as a temporal moment.

- being looked at in a media-archaeological way, that is: close to the technology itself, there is nothing "anarchic" in the digital world; every action here is based on precise algorithms. The archive must thus be re-defined in techno-mathematical terms.

- What in public discourse and especially in the artistic world is frequently called the "archive" turns out to be, in most cases, a most unprecise metaphor for all sorts of collections and memory. How to live in an(-)archival world, in which everything appears to have been pre-empted?<sup>9</sup> very term "anarchival impulse" is itself an indirect indication that archival rules still insist and archival power still fascinates; let us thus recover the positive sense in the archival order

- media-archaeological focus on the message of the medium itself. Applied to memory agencies and especially to the "digital archive", this method leads to a new interpretation of the different epistemological and aesthetical dimensions of what is commonly called "the archive". So far, "exclusively spatial terms, such as installation, storage, collection, have dominated the art discourse on archival methods and practices, emphasising the stability of archival content and its narrativity"<sup>10</sup>, as once expressed in the exhibition *Deep Storage* on artistic archive practices.<sup>11</sup> While the traditional archival format which is spatial order and 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. This different kind of archive is synchronous with the present itself, in its essence rather generative than memorizing

- Panos Kouros: "performative archiving" as a dynamic process of archive-making which evolves in the present, open for permanent re-editing and adding of new terms - the logic of the Internet in fact, like the Wikipedia principle

- not confuse storage with archival input; painting as layered "acumulation" of temporary versions, unlike sectors / overwritings of an image DVD = e-mail Hugo Barata, May 30, 2017; there is analog storage (in the technical sense, such as phonographic records), still a layering of images or an "accumulation" is already an archive, on the contrary: a collection or palimpsestuous superposition is arbitrary, whereas an archival ordering of records follows a pre-structuring sequence of selective steps (the "algorithm" of memory, be it administrative or other). On the DVD, in fact, there is an addressable distribution of data blocks in sectors - archival in the precise sense of addressing

- unlike traditional encyclopedias like the Encyclopedia Britannica, the interactive online encyclopedia Wikipedia is updated in its knowledge almost by the minute. The radical temporalization of knowledge space transforms the "archive" dramatically, with the new "Web 3" economy being the realtime net.

- if the Google search engine architecture and infrastructure may be

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<sup>9</sup> See the journal *Springer* in 4/2012, thematic issue "Leben im Archiv" ("Living in the Archive")

<sup>10</sup> Panos Kouros, The Public Art of Performative Archiving, in: same author / Elpida Karaba (eds), *Archive Public. Performing Archives in Public Art. Topical Interpositions*, Patras (University of Patras / Cube Art Editions) 2012, 41-53 (42 f.)

<sup>11</sup> See the exhibition catalogue Ingrid Schaffner / Matthias Winzen (eds.), *Deep Storage*, Munich (Prestel) 1998

reminiscent of an archive, this is not the classical archive any more, but a processual one, with the Page Rank algorithm re-generating the ranking of retrieved information according to statistical and referential (URL links) values and weighting (the genotypical level). It is still a rule governed, programmed system which organizes information so that it may be retrieved, but different to the traditional archive this archival "inventory" is updated - and indeed reconfigured - at an incredible speed: always another archive (on the phenotypical side).

- "Typically the dynamic dimension of the web is largely beyond the scope of search engines. They survey static web pages, relegating real time dynamics to the so called deep web (Halavais 2009, 16). Thus archives still exist, helping you find your way around the anarchival of the net" = 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) 2010, referring to: Alexander Halavais, *Search Engine Society*, Cambridge (Polity press) 2010

### **YouTube: An(-)archive?**

- debatable whether moving image portals in the Internet like YouTube represent an "archive" at all, or rather anarchival

- video portal like YouTube = repository in archival terms.<sup>12</sup> "The digital archive is by nature a database."<sup>13</sup> Digital media platforms like Facebook, Youtube or Wikipedia represent rather searchable data banks than archives in its proper sense. YouTube is rather a random collection than a well-structured archive, since it is user-generated, a generative archive. Its order depends on the accidental meta-dating (tagging) by the content-providers, not on any archival logic. Its archival logistics is rather the underlying structure of video database management. Archives of moving images, in the age of YouTube and UbuWeb, themselves get in motion.<sup>14</sup>

In [www.ubuweb.com](http://www.ubuweb.com), the moving image contents can not be algorithmically searched and accessed; being rather a media library, "YouTube is not itself an archive. Preservation is neither its mission nor its practice."<sup>15</sup> Rick Prelinger defines the Internet Archive in San Francisco itself as a nonprofit "digital library" = *ibid.*

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<sup>12</sup> For a discussion of this point of view see Frank Kessler / Mirko Tobias Schaefer, *Navigating YouTube: Constituting a Hybrid Information Management System*, in: Snickars / Vonderau (eds) 2009: 275-291 (277)

<sup>13</sup> Pelle Snickars, *The Archival Cloud*, in: ders. / Vonderau (eds) 2009: 292-313 (304)

<sup>14</sup> See Ekkard Knörer, *Trainingseffekte. Arbeiten mit YouTube und UbuWeb*, in: *Zeitschrift für Medienwissenschaft* vol. 5, no. 2 / 2011, 163-166

<sup>15</sup> Rick Prelinger, *The Appearance of Archives*, in: Pelle Snickars / Patrick Vonderau (Hg.), *The YouTube Rader*, Stockholm (National Library of Sweden) 2009, 268-274 (268)



## ARCHIVAL ACTIVITY

### **Algorithmically questioning / answering the archive**

- dynamic access replacing static classification of traditional catalogue, just like statistical probabilities have replaced particular knowledge in information theory, and pattern recognition replaces alphabetical identification towards open forms of adapting knowledge

- reading resp. listening is "distant" when it takes into account the archival metadata; hypertextual links of documents: "computational or algorithmic analysis can be ethical precisely because it takes into account the fullness of the archive insofar as all the indexed data related to the narrative of every survivor is part of the analysis. [...] algorithmic or computational modes of analysis [...] allows a multiplicity of complete queries [...]" = Todd Presner, *The Ethics of the Algorithm: Close and Distant Listening to the Shoah Foundation Visual History Archive*, pdf *online*; draft March 2012

- "tectonics" = architecture of the archival order; archival principles: in/accessibility ("protected mode" for good reasons, against dilettantism of "open access"), longevity; mis-understanding: archive not primarily about total memory, but selection / oblivion ("right to forget"); "principles" = *arché* (Foucault); keep separate: internal administrative archive and its algorithmic unfolding; authenticity of the record; "archival body" (*Archivkörper*); provenience / pertinence; *technical* pre-structuring of archivable records (Derrida); "Aktenplan" as kind of flow chart (known from computer programming)

- recording / storing in real-time versus classical archiving as a post-process; "register" (computational term in CPU) vs. "archive" (inbetween: *Altregistratur*); buffer / cache memory; intermediary storage. Digital culture = *registratory* present; distinguish from conventional archives: the pre-emptive mode (*futurum exactum*); predictive algorithms; catechontically resist temporal change (momental rather than documentary); neg-entropic (against time-arrow of decay, in the symbolic code); archive strictly as Read-Only-Memory (ROM / irreversible), not: RAM or EPROM

- *Register*: 1. One of a small number of high-speed memory locations in a computer's CPU. Registers differ from ordinary random access memory in several respects: There are only a small number of registers (the "register set"), typically 32 in a modern processor though some, e.g. SPARC, have as many as 144. A register may be directly addressed with a few bits. In contrast, there are usually millions of words of main memory (RAM), requiring at least twenty bits to specify a memory location. Main memory locations are often specified indirectly, using an indirect addressing mode where the actual memory address is held in a register. Registers are fast; typically, two registers can be read and a third written - all in a single cycle. Memory is slower; a single access can require several cycles. The limited size and high speed of the register set makes it one of the critical resources in most computer architectures. Register allocation, typically one phase of the back-end, controls

the use of registers by a compiled program. [...] 2. An addressable location in a memory-mapped peripheral device" = on-line Dictionary of Computing FOLDOC (Denis Howe), state Feb 27 1993, accessed 1999

## **Dis-ordering images**

- cultural analytics: interest in the work of the algorithms themselves, not only their output; Matthias Wannhoff; <https://www.medientheorien.hu-berlin.de/hausarbeiten>

- experimental media archivology; an ordering can not "tell a story"; in fact algorithmic listing is a critique of narrative ordering itself ("Telling vs. counting"). Ordering digital "images" by id, pseudo-random hashes etc. reminds human culture of different orders of things indeed (quite Pythagorean: world relations = number ratios; think of Kurrenmi's music theory)

- "searching images": [www.suchbilder.de](http://www.suchbilder.de); Flash animation on top: pixels "sorting" themselves, slowly, according to colour affinity; in its dynamics not preservable with archive.org (Wayback Machine)

- "stories" of the listings would rather be hallucinated by their human interlocutors; the narrative approach is not the most in tune with the form of the ordering

## **Return of the archive**

- signal-based, dynamic memory is sonic by nature (time-based, no more subjected to the spatial order)

- signal analysis instead of philology of symbolical notation (alphabet, musical score); access to the indexical, physical traces of past soundscapes; implicit knowledge that is stored inside technology = media-archaeological alternative to Polyani's notion of (only apparently archaeological) "tacit" knowledge. A historical recording like an Edison phonograph cylinder contains physical traces of the past, but a Nintendo "Game and Watch" handheld electronic game from 1981 also does: its electronic circuitry, its ICs and its loudspeaker enable us to experiment analytically, recreating the same auditive events that the device would have produced when it was first sold.

- algorithmically processing information, making it imperative to work with the original hardware - or emulation? - versions of the electronic toys

- archive as symbolic regime returns within digital culture, more than ever. The binary operation is archival by its very electrotechnical essence, but the algorithmicized archive is dynamic, that is: more musical in character.

- political, cultural, social and software-driven implications of techniques for data clustering arise only with classification by meta-data

- "Whilst accessible tools and cheap storage provide new opportunities to

'cache' one's life, practices of editing and annotation are largely being replaced by passive accumulation" (Katrina Sluis). Against this, "algorithmic memory" makes use new options folded into techno-mathematical records, examining the material and logical structures which support and drive the sorting, searching and filtering of digital memories

- digitally speaking (on the bit-critical level), all data are equal, whether they are text, image, sound, protocol, or program code; differentiation on format (and transmission protocol / compression) level

- not just the individual data that are being stored in databases, but the structure of the database itself, relationships and correlations between the various data, metadata; "even secret files suffer a loss of power when real streams of data, bypassing writing and writers, turn out merely to be unreadable series of numbers circulating between networked computers."<sup>16</sup>

- data flows once confined to books and later to records and films are disappearing into black holes and boxes that, as artificial intelligences, are bidding us farewell on their way to algorithmic commands. In this situation we are left no longer with reminiscences, that is to say, with stories, but with storage and its numeric addresses.

- behind almost all activities in the world nowadays there lurks an immaterial archive, such as the storage of data from video surveillance and other security equipment: already "living" in the world's online archive, or, more to the point: we are living in the world-as-archive, coupled instantaneously to constellations of databases.

- "Archives no longer just contain our past for inspection by historians, tax collectors and other researchers. We are permanently living in archives: All the sites we visit on the Internet are logged by our search engines. All our shopping is registered by our supermarkets. Each time we perform an electronic act we add information to the running archive of our activities as both individuals and members of target groups. On the basis of such archives the policies for the future are being planned [...]."

- ecstasy of the archive when connected *online* to any present computer-based action (Wireless LAN for example); this means first electrification (speed of light) and second binary mathematization; once instantaneously available and accessible, archives become an essential factor in acting in the present

- digital (like neuronal) memory no static system. "Memory is something that operates in the present and through that act is continually updated. Research into such functions of memorizing or information storage provides not just interesting knowledge in *its own terms* = the (media-)epistemological approach of Media Studies; "models and tools for understanding the possibilities of nonlinear computing and nonlinear database linking technologies"

### **Information-entropic imagery (Constant)**

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<sup>16</sup> Kittler, Gramophone 1999, Preface, xxxix f.

- [www.activearchives.org](http://www.activearchives.org); algorithmic de-humanization of record memory; case "*Erkki Kurenniemi (in 2048)*" (*preliminary work towards*) an online archive; Kurenniemi documented his life, but not archived it - waiting for computational intelligence to organize it in 2048. Multiple partial orders coexist in digital virtuality, *n*-dimensional; trans-archival aesthetics: "data laundry" files have no special meaning in themselves as "originals", viewed through the lens of an algorithm; open computer vision (by algorithms). "Whispers of data": the "archive within" the digital image; in addition: metadata contained in the metadata of a JPG image; f. e. information about the camera at moment of shot; when it was taken. Camera stores pictures on internal memory card; same logics like applied by intelligence services; in legal terms: pornographic images protected, modulated / obscured by informational aesthetics

- "image" in its diagrammatic, algorithmic, trans-iconic sense can be "an interpreted composition of pixels, a collection of statistics, lines of contours or directions, a music score" = Constant: E. K. (In 2048)

- humans incapable to navigate audio-visually through such records; intelligent agents - algorithms - generate patterns by sorting which make data accessible for human "interpretation". Such pre-structuring is the media-archaeological act

- the immediate iconological appeal of the digitalised image is arbitrarily deconstructed to provide different patterns and forms of *Gestalt*

- media-*active image* archaeology; "doesn't appear in the viewer's retina"; each image can be understood to contain its own latent "knowledge"; cp. sonicity

- the "active", algorithmically executable record is no longer "archival" (*stasis*); DH results from such algorithmic generation of new insights (Manovich's "visual analytics") comparatively banal? Lev Manovich, *How to Compare One Million Images?*, in: *Understanding Digital Humanities*, edited by David M. Berry, Basingstoke (Palgrave Macmillan) 2012, 249-278

- Geoff Cox / Nicolas Malevé / Michael Murtaugh, *Archiving the Data-body: human and nonhuman agency in the documents of Kurenniemi*, typescript for Krysa / Parikka (eds.) 2015; [http://activearchives.org/wiki/Archiving\\_the\\_Data-body:\\_human\\_and\\_nonhuman\\_agency\\_in\\_the\\_documents\\_of\\_Kurenniemi](http://activearchives.org/wiki/Archiving_the_Data-body:_human_and_nonhuman_agency_in_the_documents_of_Kurenniemi)

- by-pass privacy and copyright limitations of "open access" to the Kurenniemi estate, the (partly pornographic) images are computationally tumbled / obscured / data cloud - without destroying the unique archival images. By-passing such limitations as productive bias:

- legal (copyright / privacy) constrains creatively force to consider alternative ways of archival re-presentation", by-passing the "retinal" approach to the original image, rather unfolding different approaches from the nonhuman point of view" (Constant): different algorithms for face recognition, color analysis, contour detection, unfolding implicit knowledge of the non-semantic content of the documents collection

## "Algorithmic radio" (Constant)

- Constant, "Data Radio" project; spectrum sort of audio files from the Kurenniemi archive; cp. sonic articulation program "Mr. Kov" (Martin Carlé; speech segments; cp. project Herfried Weiser, quasi-phonetic Kittler-video cutting)
  - "listening" to Kurenniemi's auto-biographically recorded voice diary on cassette tapes through the ears of the algorithms
  - multiple correlations vs. fixed taxonomy; thus: not single sound files are being revealed, but relations within sound bits within, a *diagrammatic* sonic archive
  - Kurenniemi's audio cassettes (Philipps-Recorder); speech with Spectrum sort-Algorithms (loudness / dynamics in decibel), selecting song-like passages; use same algorithm for Lautarchiv, Berlin
  - Kurenniemi's cassettes: "Dataradio", ways of navigating the audio-visual recordings; applying Spectrum Sort according to frequencies (FFT) to Kurenniemi's digitized cassettes, breaking the sound into one-tenth of a second fragments, they can be re-arranged according to their loudness (or silence) in the frequency band. Uncannily close to artificial sound and voice synthesis, the algorithmic associative memory reveals the quality of Kurenniemi's expressiveness: "The algorithm's and the human's voice combine" = Cox et al. 2015: 136
  - refers back to Kurenniemi's DIMI-A itself = Digital Music Instrument, Associative Memory, 1969: selection of audio data according to memory content rather than by addresses = hashing
  - cp. Amit Pinchevski, proposal of algorithmically "looping" similar expressions in audio Holocaust testimony; most un-human algorithms un-cover the most human / bodily moments in Kurenniemi's cassette recordings; condition for such algorithmic research: that the original tapes remain intact (archival care); combination of both traditional archive and algorithmic laboratory
  - signal-to-noisy ratio: separate speech from background
  - *specific* search tools for audio archives, different from search tools for "image" archives; Constant file associative\_memory.aif
  - the *sonic* refers to search algorithms as well: sonic analytics; algorithmic ("automated") tagging (mark-up), a kind of metadata from within the medium; oppose / combine with "social tagging" which is non-classified in similar ways: hybridisation
- algorithmically / automatically tagging "silence" (intentional and non-intentional one)
- AUDACITY: "Silence Finder"; further: "Echo"; "Beat Finder"; spectral analysis

- algorithmic annotation with software from computational linguistics: temporalizing phonemes; software PRAAT (Netherlands), PLP Laboratory; University of Mons: voice synthesizer

## TRANSITORY ARCHIVES

### **New media, memory**

- mechanical physics of storage against fluid (electro-magnetic) memories: "Of these recording methods, magnetic tape is the worst and needle-in-the-groove mechanical is the best" = McLean 2000: 255

- "pregnant moment" (Lessing) by photography; from long-time exposure (for techno-chemical reasons) to catching a moment, archiving an instant of time, a dramatic, time-critical escalation, almost mathematization of memory

- film / videography of the dance performance; time-objects (even variable media art installations) can only be caught by storage media which are themselves kinetic; the resulting objects (a film reel, a video tape) is in itself an immobile, very material, rather spatial than temporal object

- classical analogue media such as phonograph and cinematography already preserving the formerly time-based, process-oriented, variable, transitional - the human voice, music, movement, which formerly could only be symbolically remembered (by notation in the alphabet and music notation, or drawing)

- with the arrival of electro-mathematical media a new level of micro-memories which needs to be described in terms of storage (Babbage) rather than memory or remembrance (even though the metaphorical notions persist even in technical language). "That portion of the Analytical Machine <...> is called the storehouse. It contains an indefinite number of the columns of discs describe by M. Menabrea", the Ada Lovelace comments in "Note B" to her translation of Manabrea's description of Babbage's proto-computational Analytical Engine = L. F. Menabrea, Sketch of the Analytical Engine invented by Charles Babbage, orig. in: Bibliothèque Universelle de Genève No. 82, Oktober 1842, in: Taylor's Scientific Memoirs vol. III, 666-731. Reprint in: B. V. Bowden (ed.), Faster Than Thought. A Symposium on Digital Computing Machines, London (Pitman Publishing) 1953; Paperback edition 1971, Appendix I, 341-362 (text Manabrea), here: 374 ff. (374)

- digital „tele“communication, even though subjectively perceived as almost immediate data transfer, is based more than ever on a system of short-time storage (cache, f. e.) which belongs to the operation of real-time effects. This new media-archeological layer of time-critical, invisible memories, asks for theoretical reflection in its own techno-logical terms (i. e. taking into account both the electro-physical and the mathematical aspect of so-called „new media“)

- keep data in latency for action - rather a kind of *cache* memory in administration than a detached place of cultural memory

## **Latency, hysteresis**

- a state of *latency* (of deferred presence) aptly describes the nature of transitional, dynamic archives.

- while "transient" is a term for phenomena experiencing a change as a function of time (temporary phenomena), such as the dramatic "content" of a video art piece = Magrab / Blomquist 1971: 320, in reverse, the archival object (the carrier medium: the video tape and hardware facilities) is meant to remain intact and basically unchanged over time.

- a couple to technological terms do not denote storage but, given a second thought, turn out to be dynamic intermediary memories (delay memories), such as the phenomenon of hysteresis, a kind of electronic lag: "The summation of all effects <...> which causes the output of an instrument to assume different values at a given stimulus point when that point is approached first with increasing stimulus and then with decreasing stimulus" = Magrab / Blomquist 1971: 312 such as in magnetic recording

## **Digital memory**

- audible difference, by shifting the sampling rate, significantly refers rather to the noise of the recording device (the ancient wax cylinder) than to the recorded voice. Here, the medium talks both on the level of enunciation and of reference. What do we hear: message (the formerly recorded songs) or noise (the wax cylinder scratch and groove)?

- media-archaeological awareness; Edison recording primarily memorizes the noise of the wax cylinder itself - which is different kind of "archive", not cultural-historically, but cultural-technologically, a different kind of information on the real. Media archaeology opens our ears to listen to this as well, not to filter this out (against the "cocktail party effect" of hermeneuticised psycho-acoustics).

## **Not to be confused: Archive, memory, storage**

- archival function is not semantic "memory" but a storage technology, rather an organizational form, a well-defined system, a format of symbolic order by meta-dating, a rule, non-invasive to its object

- "experimental archives" different from the well-organized institutional archive. Quantized (digitized) analog films can be transformed into a vast image bank which then as data-set can be, unified, subjected to image-based search operations such as matching of similarities, object feature detection, statistical colour value comparison etc.

- *within* storage media, a non-social memory is at work, displaying a rich memory culture of its own, inherent logic, specified for the needs of the so-

called "von Neumann - architecture" of computers we still use after half a century. Let us name the modules of this techno-mathematical memory - which turns out to be a metaphorical transfer of terms well known in traditional archivology. The closer we look at this micro-memory architecture, the more its topology and organization turns out to be a mirror of traditional archival and administrative practice - but merging both areas, which have been discursively separated rather emphatically in cultural use, into one operational horizon, by including the storage elements *immediately* into the current action (and the action of the electric current, cut digitally).

- core of digital element is the single storage element (with its smallest unit being a flip-flop, a binary unit to store or change one bit of information)
- the protected storage as "protected mode", the real "secret archive"; read-only storage
- the register (a term well known from traditional archival sciences, now being used to define the smallest intermediary storage element in computing)
- the accumulator as a special register for numeric calculations (thus in need of cells for the storage of intermediary results)
- the buffer (for explicitly transient <vorübergehend> data storage, when these data are being transferred from one functional unit to another)
- storage organization, with its different modes of access to stored data: direct access storage; sequential access storage; indexsequential storage; pushup and -down storage; word-organized storage
- associative storage with its special characteristic that its stored elements can be adresses *by content* (of parts of it)
- "hashing": sorting memory content from within
- for the "content" of this techno-numeric memory, there is still the format of the "record", the well-known "file"
- cross-referencing of storage and transfer which is characteristic of computer memory becomes appararent with the close coupling of storage to *timing* (Ge/Zeiten): cycle time; latency (the time it takes in a functional unit for data to be shifted and re-located); access time (by definition<sup>17</sup> the sum of latency and transfer time); time-critical storage; Turing: "scroll"; writing/reading head in a Turing machine is strictly indifferent to any semantic meaning of the symbol strings concerned. But how can human readers resist the temptation of projecting a face upon archival files, As has been performed by a permanent media installation of Christian Boltanski at the Art Room at the University of Lüneburg literally, called *The archives of my grand-parents*; see a notice in the journal: art 11/1996, 8

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17 See DIN 44300 (Deutsche Norm) Informationsverarbeitung: Begriffe, Entwurf March 1982



## **Archival dancing, archival singing: How to deal with the transitional?**

- since end of 19th century a new type of non-archival records: signal storage of the (physically) real; indexical photography / acoustic phonography
- "archives" of kinetic (mouvement) / kinetic (mouving) archives
- The William Forsythe initiative, f. e.: His *Motion Bank*, an open source project of the videographic dancing notation in a special software, which can interactively be used online: [www.theforsythecompany.de](http://www.theforsythecompany.de)
- while traditional function of the (dance) archive is to document a performance which took place at one time and one place, the emphasis shifts to the re-generating dance performance which is being (co-)produced by the online user for their own needs. There is still an archive, the *arché*: in Kant's words the condition for the possibility of the performance to take place at all. The real multi-media archive is the *arché* of its source codes, but in a different form of existence: algorithmic dynamics instead of documentary stills.
- sound "archives" dealing with the transitional; the challenge of archiving transitory media art

## **Proposal: a double strategy**

- strategical macro-archives, tactical micro-memories
- trans-archival notion of "organizational" instant memory may serve to describe the logic of internet memory; leaving the neurological metaphors beside, this approach dissimulates the existence of material memory agencies - both hardware and institutions, which still govern the power of what can be stored legally and technically, and what will be forgotten; memory-politically still on-going impact of traditional paper records
- differentiate between the documentation of media artistic performances (by video recording f. e.) and the media art monuments themselves (an artistic video tape) - to use a difference articulated by Foucault's *Archaeology of Knowledge* (monument / document). A centre for Art and Media could be a place of experimenting new, different forms of the archive, the dynamic archive / archival fields, the generic archiv: generated *on demand* by (online) users.

## **What separates media arts archives from institutional ones?**

- institutional archives = strictly rule governed, "administratively programmed systems" (Jakobsen)
- unlike analogue broadcasting of radio and television transmission (live transmission), that is: the disappearance of the signal as soon as it has been transmitted, "all digital media communications have a "save" function. Every communication may in principled be frozen and preserved for posterity. Many

new digital media platforms like Facebook, Youtube or Wikipedia *are* indeed searchable archives" = Jakobsen 2010

- with Internet economy, reverberating circuits gain dominance over memory involving records (Krippendorf). Internet a data circulation of discrete states, without central agency and an organized memory; "yet something like classical archives are vital to the functioning of the anarchival world. When using a search engine like Google, you are actually not searching the net, you are searching documents that have been *crawled*, that is compressed, and prefixed in the Google repository by docID, length, and URL, before being indexed according to Google's famous secret formula and archived in virtual barrels"; Brin, Sergey and Lawrence Page, The Anatomy of a Large-Scale Hypertextual Web Search Engine, in: Computer Networks and ISDN Systems, volume 30, issues 1-7 (1998), 107-117

- when archive becomes temporalized and time-critical, it loses its traditional definition as permanent working memory of a *state* (both abstract and concrete). When the archives increasingly becomes an intermediary memory, it is not separated but directly coupled with the operative procedures of a given presence, involved in just-in-time and real-time processing, thus tending more to the register (a temporary deposition) than to the end-archive.

- non-archival forms of memory, transitory memory as experimented by time-delay media art works; genuinely media-inherent memory (storage devices, dynamic memories like the difference between RAM / ROM), which - though looking simply like technical solutions - have an epistemological, memory-cultural dimension (to be worked out by media archaeology which rather concentrates on storage, not - like cultural studies - on discursive memory)

- media archaeology, confronted with Cartesian objects, which are mathematisable things, describes the non-discursive practices specified in the elements of the techno-cultural archive

- focus on differential storage (delay memories); von-Neumann architecture for the archive (in parallel to computing): data and programs (archival coding / system) in the same operative unit, allowing for instantaneous *chance* of the archiving system adaptive to the objects (being visual, textual, acoustic)

## **De-frozen archives**

- anecdote Earl of Münchhausen: in Winter the brass tube tones freeze and will be de-liquified in springtime, sounding again. Since Phonography (Edison 1877) this became technically true - different from the memory mechanism in the brain (Bergson, neuro-biology), and different from text-based memory (the traditional "message" of the medium archive is the alphabet)

- analogue media (grammophone, cinematography, magnet tape for music and video); now re-entry of the "discrete" memory, the alphabet, the coded symbols, but alphanumerically, not simple speech-orientated, but as well mathematical, and only operative when implemented in physics of computer

("hardware"), a system which now is able to emulate the "analogue" itself (Digital Signal Processing in real-time)

### **Special case: media art born digital**

- analogous media arts like photography, phonography, cinematography, then electronic radio, tape recorder, television, video need to be preserved physically (and may only be meta-dated by the digital archival system); media art born digitally: as web-based interactive art f. e.; this can be archivally emulated, like previous computer games such as *Space War*

- proposal Richard Rinehart: Save the „score“, that is the essential qualities of a piece of new media art, by a special purpose descriptive language developed at Berkeley

- difference between simulation and emulation is an ontological one (since when it comes to art, games et al. produced on von Neumann machines, the emulating computer *is* in the "state" of its precursor - a new kind of existence). While early emulations of, f. e., a Commodore C64 computer game on a much more recent computer, suffered from the fact that just the logic could be re-enacted, but not the electronic components (like the very processor itself), not their physical qualities, deficiencies and idiosyncracies, recent computing emulated its predecessors with physical modelling itself.

- if source code co-archivized (the true hidden archive behind the apparent memory archive as *a priori*), digitally born media art can be truly re-encated within the computer archive (whereas quantized film works, f. e., can only be re-produced)

### **Micro-media memories: storage devices**

- close reading of memory on the media-archaeological level discloses not transitions, but abrupt, necessarily discontinuous jumps - at least when it comes to analyze memory in digital culture. Since within computing architecture, memory is no discursive flow (equivalent to the electric current), but on the contrary dissolves into discrete elements, with its smallest unit being the bistable element (or flip-flop) which is the hardware embeddedness of the logical binary digit (bit) representing the smallest unit of information (a single pulse position). This smallest unit of memory may consist, f. e., of two correlated (short-circuited) thermionic valves: "A circuit in which the output has two stable states (output levels 0 or 1) and can be caused to go to either of these states by input signals, but remains in that state permanently after the input signals are removed" = Magrab / Blomquist 1971: 305

- micro-memories on the level of techno-mathematical storage operations,

similar to the gapp between the quantum-mechanical level of reality and the humanly perceivable macro-physics (where Newtonian physics is still intact); clarify relation between (transitions in) this micro- and macro-level of memories (storage / "social memory")

- memory on demand: *cache memories* as condition for realtime data processing - no memory in the emphatic sense, but dynamic temporary storage
- maximized computer memory capacities still continues an old occidental obsession that culture depends on storage (historic architectures, libraries, museums); future cultural emphasis will be rather on permanent transfer, not storage (without undoing storage, though); already an implosion of storage mania into processual data flows, a different economy of the archive as dynamic agency "online"; notion of immediate data feedback replaces the data separation that makes all the archival difference
- with digital archives - in principle - no more delay between memory and the present, but the technical option of immediate feedback, turning every present data into archival entries and vice versa. The economy of timing becomes a short-circuit
- "Streaming media" and storage become increasingly intertwined with intermediary storage

## Dynamics in the archive

- earliest known recording from a television program transmission is the revue *Looking In* (written by John Watt), performed by the Paramount Astoria Girls, on the BBC Baird television system (30 lines) on 21st April 1933 ("Vision 262.6m; Sound 398m), recorded by an enthusiastic amateur on his equipment (the Baird Phonovision system) on aluminium disc. Processed and restored by digital filtering, the path to clarity is time-critical movement itself. Any reproduction of one of the 30-line television broadcast stills in a printing medium (the book) gives a wrong impression of what had been actually seen: "Though we have only 30 lines and only so much detail along a line, we are missing a crucial element: time. <...> As the image is the a still built up from just 30 lines, it is difficult to distinguish between what is image and what is not. A single frame of the Paramopunt Astoria Girls may be crudely recognisable, but hwen seen as a moving dynamic television image, / the girls come to leife before our eyes. There is something strange at work and it has much more to do with what we perceive than what is ther 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. We interpret the model into a real-world scence" = McLean 200: 211 f.

- as a "monument" the Baird *Phonovision* recording disc is part of the classical archival techniques (inventorisation, keeping) such as any other classical paper record. The difference is *operative*: as a "document" it comes only into being (i. e. "readable", recognizable for the eyes) when being processed / played a) by a technical medium (first the Phonivision electro-mechanical Baird equipment, now the digital restoring computer) and b) when kept operative by an on-going medium, which requires the archival artefact to be processed *online*:  
<http://www.tvdawn.com/silvaton.HTM>; © D F McLean 1996

- one form of computer memories, the most difficult and most expensive system component in early computing, in one variance (magnetic drum storage) has been literally transitional; the alternative static *versus* dynamic data storage in early computing looks like technologically equal solutions; in fact the difference has an epistemological dimension

- so-called *chaotic storage* method in economy reduces access time and storage space to the max; information in the Internet is transient and "shelved"<sup>18</sup> just for limited time intervals ( $\Delta t$ ); *organizational memory*, like the Prussian State Archives structurally preserved rather the organizational memory of state administration. The authoritative *archive* (in Foucault's sense) of technical protocols replaces the content-based (mis-)understanding of the traditional(izing) archive

- with supremacy of selection over storage, addressability over sorting, no memory in the emphatic sense, rather a function of *transfer* processes

### **Dynamic storage (delay lines)**

- delay considered as temporary storage already: "In communication, delay is a most unwelcome phenomenon, but from the angle described above <sc. "as a hybrid and transition between communication medium and storage medium">, it <sc. delay line> is volatile, short-term storage. Long-term memory, too, originated from a new interpretation of a technical disturbance e- feedback. <...> it demonstrated the technical feasibility of storage in an ephemeral medium."<sup>19</sup>

- technology of delay lines and storage tubes (acoustic / optic), though being a well-defined device limited to a micro-technological configuration, may at the same time serve as an indicator or a shift of emphasis in memory culture from the classical idea of "eternal" preservation to transitory (as well as vanishing) memories, memories with a "time to live", like in internet data transfer the "Ping" signal

- "There are two requirements that must be met to build such a quasi-real-time system. First, the in-transit storage at each node should be minimized to prevent undesirable time delays. Secondly, the shortest instantaneously available path through the network should be found with expectation that the status of the network will be rapidly changing."<sup>20</sup>

### **The archival "field"**

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18 Editorial: The Internet. Bringing order from chaos, in: Scientific American vol. 276 no 3, march 1997, 494 (49)

19 David Link, There Must Be an Angel. On the Beginnings of the Arithmetics of Rays, in: Siegfried Zielinski / same author (eds.), Variantology 2. On Deep Time Relations of Arts, Sciences and Technologies, Cologne (Walther König) 200xxx, 15-42 (30)

20 Baran: *Distributed Communications*, I, 24

- term from mathematics: vector fields, referring to the calculation of Michael Faraday's discovery of the "electro-magnetic field" by James Clerk Maxwell (Maxwell's Equations). The neo-logism "field" in early 19th century served to describe a phenomenon (elektro-magnetic induction) which could not be reduced to terms from Newtonian, classical physics like "matter" and "energy", representing rather a cross-referencing of both ontologies
- to the traditional archive, its message is the alphabet: textual documents; the symbolic order of the archive and its politically orthodox function corresponds to alphabetic writing as symbolic order (Jacques Lacan)
- different from the script-based archive, audio-visual archives operate on the level of the physical and physiological real (to follow one again Jacques Lacan's distinction as applied to technical media by Friedrich Kittler<sup>21</sup>), a dramatically non-symbolic field, closer to the electromagnetic field and its streaming dynamics than to the symbolic order; a re-entry of the symbolic order in post-analog media, in alphanumeric computing

### **Archival *analysis* (mathematization)**

- content with media archives is radically time-based (be it video or sound files); physical parameter  $t$  thus adds a "time-axis" (like at an oscilloscope) to the formerly spatial archive
- electronic media content can only be presented processually (the moving image / the unfolding of sound as music, be it by analogue or by digital machines required for such monitoring), the analogue carrier medium itself (film reel, video tape, musical record) has to get in motion
- phonographic record containing the voice of emperor Hiroito declaring the Japanese capitulation at the end of World War II in August 1945, as preserved in a climatized vitrine box at the National Museum of Broadcasting in Tokyo

### **Re:load. Archive and cybernetics (economy of circulation)**

- Internet communication tends to *move* the records towards an economy of circulation: permanent transformations, up-dating, metamorphoses; "cyberspace" not primarily about memory as cultural record, but rather a performative form of memory as communication. Within this economy of permanent re-cycling of information, there is no need for emphatic, just short-time, "up-datable" memory - which curiously comes close to the operative storage mechanism in the von Neumann architecture of computing
- shift of emphasis from rather permanent memory to short-time intermediary memories a function of shift from mechanic, strictly ordered, classificatory "library" order towards electronic = dynamic, ephemeral technological physiognomies. Intractive, electronic fields, under the label of "cyberspace",

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21 Friedrich Kittler, *Grammophon - Film - Typewriter*, Berlin (Brinkmann & Bose) 1996

converge with the human nervous system - intellectual legacy of Norbert Wiener's *Cybernetics* (1948) turned real with interactive media

### **Channel time and time channel: Transmission replacing storage?**

- communicative action-at-distance *from point to point* not limited to spatial channels in the present but to the temporal channel as well across temporal intervals (past / present), conveniently called "the archive". Seen under this (media-archaeological) perspective, transfer and storage are both sides of one coin: Storage is nothing else but a transfer across a temporal distance <see TS Hirt 2007: 6>

- *memory* technically defined as "device into which information can be introduced and then extracted at a considerably later time"<sup>22</sup> - thus closer to what is technically known as a buffer in electronics: "A circuit element which is used to isolate between stages <...>. Storage between the input/output equipment and the computer where information is assembled in easily absorbed units; storage between the main memory and the computer where information is rapidly accessible" <Magrab / Blomquist 1971: 305>. The difference between emphatic memory and buffer thus is simply a degree of access time speed.

- minimal delay memories (like buffers) are at work even if we do not notice them. More drastically, these micro-memories dissimulate in (apparent) live transmission. In certain technologies like colour television and the oscilloscope some sort of electric signals has to be delayed against other signals (achieved by circuits and coupling of resistance and capacity or simply implemented in its most crude form in coaxial cables)

- techno-mathematical storage nothing but an extremely dilated form (in fact its liminal value / *limes*) of (that is, in the temporal channel of communication). Storage and transmission thus are relatively bound to each other, a kind of Möbius loop; their are respective opposite extremes (Kehrwerte), just like the so-called "analogue" and the "digital" are not absolutely, just relatively differentiated

- traditional separation between transmission media and storage media becomes obsolete; while storage of data on a carrying medium is passive, invariant, and subject only to physical entropy, the "becoming medium" is their processualisation - which is active transfer, data processing. Whenever an archive is being read (by humans traditionally, by machines in the new media age), it is not an archive any more, but in a momentary state of operative, dramatic presence, a memory theatre on micro-level

- with the retro-conversion of analog magnetic tapes (radio, TV) to digital storage for preservation reasons, different ways to hack into these digital memories since the digital archives, once online, are not separated from the actual infrastructure of web-based data circulation any more. In a way, of

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<sup>22</sup> Glossary, in: Edward B. Magrab / Donald S. Blomquist, *The Measurement of Time-Varying Phenomena*, New York et al. (Wiley) 1971, 314

course, this means the disappearance of the emphatic notion of the "archive"; it dissolves into electronic circuits, data flow. In a way, the (historically) "deep" archives transforms into a "flat" archive - flat in the sense of the integrated circuit (micro-chip architecture). There has always been a data circulation between the needs of an inquiring present and the archival documents; but only *online* this circulation becomes a *closed circuit* (with all its cybernetic consequences: interactivity f. e.).

- spatio-temporal entanglement: the gap between resident emphatic archives (traditionally) and ultra-speed transfer narrows; emphatic memory is progressively undermined by a shift of emphasis towards *memorizing*, the dynamic process, based rather on a network of micro-memories and interacting micro-memorial hierarchies

- alternative "storage *versus* transfer", useful for the analysis of cultural communication (since Harold Innis, *Empire and Communications*, 1950) becomes oblique; storage is nothing but a limit value (Grenzwert) of transfer

- storage itself transforms from an immobile, static state into a dynamic, processual *timing*

- function of the transmitter is to *encode*, and that of the receiver to *decode*, the message. The theory provides for very sophisticated transmitters and receivers - such, for example, as possess 'memories', so that the way they encode a certain symbol of the message depends not only upon this one symbol, but also upon previous symbols of the message and the way they have been encoded. = Weaver 1963: 17

- "The input to the transducer is a sequence of input symbols and its output a sequence of output symbols. The transducer may have an internal memory so that its output depends not only on the present input symbol but also on the past history. We assume that the internal memory is finite, i. e., there exist a finite number *m* of possible states of the transducer and that its output is a function of the present state and the present input symbol" = Shannon / Weaver 1963: 57

- Foucauldian *l'archive* recedes into the coding and protocol layer, the truly media-*archéological* (media-archivological) layer (*arché* here used in Michel Foucault's sense as the governing rule, the Kantian *Möglichkeitbedingung* for the emergence of sensible phenomena at all); already transfer needs a protocol = the essential governing law

- *real time* operations, i. e. the "processing data in time with a physical process so that the results of the data-processing are useful in guiding the physical operation" = Magrab / Blomquist 1971: 316; whereas analogue computer calculates physical processes immediately and electrophysically itself, the real time digital signal processing (DSP) requires a completely mathematical and at the same time time-critical ("synchronous") analysis of the event under observation, that is: a delicate mechanism of intermediary data storage

- well-defined mathematical notion of "information" (with its smallest unit being the *bit*) replaces the cultural desire of storage. The binary information (bit)



though is physically incorporated by electronic devices like the flip-flop circuit which is the smallest possible *storage* unit itself.

- aesthetic information becomes culturally meaningful only against storage: For musical perception, e. g., a high degree of redundancy and repetition (rhythm) is necessary to perceive melodies at all

### **Archives becoming time-critical**

- traditional paper-based non-("new"-)media archives become time-critical when subjected to electronic filing systems, with its usefulness being; shorter access times; shorter search times; decentralized online-accessability (beyond "local" space-boundedness; simultaneous (archival) file-sharing by several people

- electronic media (such as video art, as defined by Bill Viola) are not simply time-based (as defined by Gotthold Ephraim Lessing in 1766 in his treatise *Laokoon* where he makes a semio-aesthetic difference between space-based and time-based media, that is: between visual arts and poetry), but are confronted with a new type of artificial temporality: time-critical processes

- notion of "instanciation" in programming computers with its internal "interrupt" procedure reveals the delicate micro-temporal and decision-critical economy (synchronisation, clocking) of data processing in computers, a permanent interplay between internal data processing and input from the outside world, as performed daily in computer games (action games), well described by Claus Pias in his study on *Computer - Spiel - Welten*

- corresponding term in computing is "allocation", that is: the administration of computer memory space, its addresses, its valorization, real-time "archiving"

### **Feedback memory and timeshifting**

- cybernetic memory not, like traditional archives, clearly separated from the present operations (such as administration as symbolic form of the bureaucracy, and technically), but becomes cybernetically a feedback-ingredient of present operations itself, its basic condition: an almost invisible system of short-time memories (like cache-storage) is the condition for digital data processing

- (neuronal) networks with/out memory; adaptive networks require intermediary storage grids in order to become auto-adaptive („learning“ in the sense of von Foersters definition of a quantum theory of memory). Computer memory devices are closer to human neuronal memory than to cultural memory

- in terms of cybernetic brain-computer analogies, memory a (magnetic core) matrix. In the human brain there is no such thing comparable to fixed storage, rather an enactment of immediate synchronisation of distributed electro-magnetic charges in the neuronal net. On December 6th, 1896 Freud writes to

W. Fließ about his assumption of a psychic mechanism which does not diachronically consist of layer above layer, but from time to time re-configures the order of memories = Sigmund Freud, *Aus den Anfängen der Psychoanalyse 1887-1902*, xxx, 185; corresponds with re-addressable digital memory devices such as the RAM, in synchronous layers

- memory-as-image keeps its archaic form in the magnetic core memory. In W. E., *Towards a Museology of Algorithmic Architectures from Within*, in: *When Is the Digital in Architecture?*, ed. by Canadian Center for Architecture, Sternberg Press 2016, the photograph of a magnetic core memory from early electronic computing itself dissolves into pixels - a question of resolution? In this "pixelized" version, this represents almost a visual pun for the argument of "digital architecture" within the computer

- dynamics of addressing and assembling signals as data into „memory“ almost exactly corresponds to the way this magnetic core matrix is addressed and configured by a mesh of copper „nerves“ (resonant with digitally switched electricity). The analogy even extends to the co-decisive role of chemical processes within the transmission lines (nerves), as compared to inductance in electric cables.

- shifting emphasis from emphatic to intermediary memory, closer to electromagnetic remanence than to long-time archives

- within digital technologies, interlacing of live transmission and storage media is essential. The techno-culture of analogue technical (mechanical and electronical) media has generated both storage media (like the phonograph and film on celluloid) and transmission media (radio, television, „live“ media). But almost from the beginning, both radio and television had to use storage media to fill its program for both technical (Zwischenfilmverfahren) and program „flow“ reasons; on the level of human perception, though, it has not been possible to differentiate „live“ from „storage“ signals, unless verbally indicated. An uncanny temporal regime thus is at work, undead

- shift from long-time cultural value to intermediary media memories; German public TV channel ZDF, at the IfA Berlin (August 2007) announced a new online-service *ZDF Mediathek* allowing for online-reviewing of bygone programs back to one week, deconstructing the very time format of classical TV itself, the program "flow" (Raymond Williams, John Fiske), individualizing TV time; as well German Telecom announces *Entertain Comfort*, a choice of TV channel programs from an online Archive (such like a football German Bundesliga game already one hour after the event itself, almost present, near-live; see „live on tape“ concept previously), advertising „timeshift“ for temporally deferred TV at home. Video on Demand = Online Videothek. This requires a set-top box (Media Receiver T-Home X 300T) with Timeshift Function (an integrated Video recorder)

### **Capitalizing audio-visual memory? The lack of media archives**

- historical consciousness of the post-Second World War generations that grew up with radio and television now coincides with its media archives - public

broadcast archives that are not paper-based any more but exist in audio-visual form. The present and future problem is: How to get access to these new kind of archives in a non-proprietary mode? While the state always cared for public education manifested by the public libraries network and for memory agencies like the State Archives, the audio-visual memory stays mostly with companies that might sell these media-archives to private investors - with the notable exception of the Inathèque de France; *lack* of a public audiovisual media archives; structurally: most existing media libraries and search engines still dominated by access of images and sound through the alphabetic writing (meta-data)

## **The alphanumeric**

- Turing 1936/37 „On computable numbers“ conceived a symbolic paper machine based on an unlimited memory tape (derived from the typewriter tape) on which in discrete fields symbols can be read and written; manipulation of symbols strictly formal, time-discrete and machinic: the utmost operational logic of alphabetic writing (inherited by computing with alphanumeric symbols)
- 1974 XeroxParc:GUI (computer as paper simulator = regime of the traditional document-based archive / logics of traditional bureaucracy); original alternative: Theodor Holm Nelsons concept of hypertextual, even more: hypermedia links, replacing archival and library classification by links - in its extreme -from bit to bit, in fact: on the memory regime of the computer, the registers, from adress to adress, truly digitally linked
- term „audiovisual media“ (to which Argos is dedicated by its function to produce, present and preserve audiovisual media art und cultural expression) is interface-orientated, addressed to human senses (eyes, ears), while behind the surface, on the media-archaeological level, another regime is operative: the alphanumeric code which is the truth behind apparent digital sound files and images. Thus, the very term „audiovisual art“, for digital media, is an appeasement

## **Streaming media**

- streaming media = auditive or visual content "that is continuously received by, and normally displayed to, the end-user while it is being delivered by the provider"; term "refers to the delivery method of the medium rather than to the medium itself. The distinction is usually applied to media that are distributed over telecommunications networks, as most other delivery systems are either inherently streaming (e.g. radio, television) or inherently non-streaming (e.g. books, video cassettes, audio CDs)" = [http://en.wikipedia.org/wiki/Streaming\\_media](http://en.wikipedia.org/wiki/Streaming_media); accessed 9-10-07

CULTURAL ARCHIVE *VERSUS* TECHNOMATHEMATICAL STORAGE

## **Archive, memory, storage**

- media-epistemic shift from the emphasis on storage to an emphasis of instant transmission of memory-data; the technologized archive itself is temporalized; practices of short-term storages, for which the notion of "archive" might not even be proper term any more
- organizational memory operates analogous to neuronal memory: "There are actually multiple group and organizational processes occurring <...> *simultaneously embedded* within several other processes"<sup>63</sup>
- archive (opposite to the library) is a memory of procedures, not of information as such. The records kept in the Prussian State Archives, f. e., nowadays exactly mirror the procedural logic of Prussian administration - but they are themselves non-processual, lacking the dynamic dimension
- being an operational memory, any administration is closer to a computing device than to fixed storage.<sup>23</sup> The difference between the archive and computation is in the concept of the so-called von-Neumann architecture of computing: Whereas in the archive logistics and records are strictly separate, in computing the data and the programs are stored in the same memory location, being reprogrammable "on the fly". Thereby computer memory is recursive, re-generative - the opposite of the juridical task of the archive, allowing for spontaneous and dynamic adaption to new contexts - at the price of loss of endurance. Howard Aiken, on the contrary, for his Harvard computer series Mark I to IV, insisted on the separation of storage of program and storage of numbers <see Coy 2007: 81, note 4>
- storage on magnetic tape can be erased and overwritten, while human memory always keeps traces of almost any impression (Sigmund Freud); neuronal act of remembrance is an active, re-generative one, opposed to the hard-wired machinic memories. Active remembrance itself "wires" the associations always in new ways (or "paths", according to Vannevar Bush 1945)<sup>24</sup>
- Charles Babbage appropriately called what in electronic computing is named the *memory unit* of his Analytical Engine "Store"; remarkably this storage does not provide a separate memory space (as the notion of the archive implies opposite to the administrative present), but is part of an extended presence of calculation: "The calculating parts of the engine may be divided into two portions: 1st The *Mill* in which all operations are performed / 2nd The *Store* in which all the numbers are originally placed and to which the numbers computed by the engine are returned"<sup>25</sup>

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23 See Heinz von Foerster, *Memory Without Record*, in: same author, *Observing Systems*, Seaside, Cal. (Intersystems), 1984, 92-137; furthermore Klaus Krippendorf, xxx; Elena Esposito, *Fiktion und Virtualität*, in: Sybille Krämer (ed.), *Medien. Computer. Realität*, Frankfurt/M. (Suhrkamp) 1998, 269-296, esp. chapter 4 "Die Formen des Gedächtnisses: Vom Speicher zum Archiv", 288-293

24 Norbert Wiener, *Zeit, Kommunikation und das Nervensystem*, in: *Futurum Exactum*, ed. Bernhard Dotzler, 2002, 177

25 Here quoted after: Wolfgang Coy, *Speicher-Medium*, in: Wolfgang Reisig / Johann-Christoph Freytag (eds.), *Informatik. Aktuelle Themen im historischen*

- principal storage "organ" within computer ALU kind of inter-archive, a short-term memory which later, by Howard Aiken for his Harvard Mark I, has been called "register", whereas for enduring data storage magnetic tapes and punched cards figured. "Numbers may be removed from the calculating unit and temporarily stored in storage position"<sup>26</sup>

- magnetic tape stands for the clash between technological storage ("in motion") and the archival (symbolical) regime. In Samuel Beckett's play *Krapp's Last Tape* the protagonist is confronted with his own memory as recorded as audio-diary on occasion of his successive birthdays; this re-call literally re-presents both his sonic ego (the physical reality of his voice) and the situation, whereas the inventory of his tapes, the chronological order, stands for the archival regime: ordering, with no physical presence.

- final director's note is "Tape runs on in silence". A kind of dynamic silence, well-known from the archive, but this time a recording tape waiting to be recorded, a virtual archive.

- not conflate human (associative) memory with techno-logical (i. e. numerically adressable) storage

- automatic storage media usually unveil their informationen only according to a (re-)call with adresses. Human memory, though, recalls information according to its "semantic", associative content.<sup>27</sup>

- storage as cultural technolgy (libraries, archives, museums) or as techno-mathematical device (computing) differs from human memory insofar as the human mind does not re-call data from a data bank; human memory is rather remembrance: a processual synthesis of perceptual data, a kind of neuronal auto-stimulation, a re-connaissance without original (according to Gerhard Rusch's radical constructivism and to cognitive science in general), closer to pattern recognition than to archival and adressable re-call.

- main function of the archivist is *triage*: the appraisal of what incoming records can be abandoned, according to a fixed set of filtering rules (metadata). Automated search engines, on the contrary, "entropically" navigate through "big data" oceans / clouds which come closer to thermic model of the physical world itself than to be a selective memory.

- computer memory still made of fixed-size cells, that refer to each cell by a numerical address. But in order to understand technomathematical storage, we have to abolish archival or library metaphors

- storage conceptually based on passive location, with fixed adresses, *versus* human memory = associative, as expressed by Vannevar Bush "As we may

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Kontext, Berlin / Heidelberg / New York (Springer) 2007, 79-104 (80)

<sup>26</sup> Howard Aiken, Proposed Automatic Calculating Machine (1938), as quoted in Coy 2007: 81

<sup>27</sup> Karl Steinbuch, *Automat und Mensch*, 4th, revised ed., Berlin / Heidelberg / New York (Springer) 1971, 75

think" leading to the design of a Memory Extender in June 1945. Today, hashing in programming comes close to the human memory mechanism

- early (digital) computing technological storage like the mercury delay line and the Williams Tube close to human memory in its regenerative sense; computational random access memories ask to be constantly refreshed so that their "ephemerality endures" (Wendy Chun), in an almost Bergsonian vibrational sense

- artistic version of the "active archive", especially the choreographers: the concept of re-enactment of past dance performances; the performative equivalent to operative (technical, digital) "migration" of recorded data

- in non-metaphorical terms, archive is legal memory of administrative power; equals operating systems in computing today. One might call it an aggregation of files: records that can be linked, *via* the archive's index (intentionary), to the discursive loops of systems of power (administration, institutions, infrastructure)

- traditional archive for the use of historians. Electronic memories, though, require data archaeologists rather than archivists

- "Computer technology is made for information processing, not for long-term storage."<sup>28</sup> Looking at data banks from the archivist's point of view is not only worthless but even a hindrance in understanding its different nature.

- 21st century will increasingly be 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 -, is increasingly giving way to a dynamic exchange, a permanent transfer in the most literal sense. What will retro-actively remain are isolated islands of archival storage, heterotopias of "counter-spaces" as defined by Michel Foucault, monumental resistance against dynamic and permanent re-organization of data.

- "archive" both the name for a building ("hardware") and a symbolic system of organizing documents according to rules, based literally on symbolic letters ("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 abandon this very term in the age of digital media?

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<sup>28</sup> Michael Wettengel (Electronic Records section at the Federal Archives, Germany), as quoted in: Gerd Meissner, *Unlocking the Secrets of the Digital Archive Left by East Germany*; <http://query.nytimes.com/gst/fullpage.html?res=9E00E7DC1731F931A35750C0A96E958260>

- *l'archive* in Foucauldian sense a hidden agency within computing itself: the Turing machine is "defined by *constraining* laws or by an *algorithm* <...>"<sup>29</sup> - in accordance with Michel Foucault's *l'archive* rather than with the traditional notion of archives as record depositories
- archive returns even *within* computer architecture (that is why a core element in the Central Processing Unit is aptly called the "register", a term directly taken from archival terminology.).
- structure = *archive* in Foucault's sense; not to be confused with the actual records office which is always plurale tantum *archives* in French (a spelling mostly mis-translated in Foucault literature)
- storage referring to "the gesture of setting apart" (Michel de Certeau), of storing matter, energy or information for later re-use. With electronic access time of computer memory tending towards zero, this spatical notion becomes obsolete. Storage and immediate data processing are not ontologically different but differ only in scale. Long-term storage is just an extreme extension of what is called "motion" in the present; even archival storage is dynamic, even if the time span of re-actualization might last so long that it seems immobile
- photography = momentary fixation of light, different from the immediate transmission of an electronic image in television or video: In the first case the photonic event is chemically made to have a lasting effect, whereas in the latter case it vanishes from the phosphor screen of the monitor in a fraction of a second. But even this fraction is an interval, a  $\Delta t$ .  $\Delta t \rightarrow 0$ . The long-time, almost painterly, exposure of early Daguerreotypes and Talbotypes, by improved chemical sensitivity to exposure, shrank down to the notable photographic "click" or "shot"
- "live" signal transmission characteristic of electronic media (radio, television); the Marconi Telerecording system, developed in 1957, intercepted such electronic images by a film camera with fast intermittent mechanism, while sound was recorded on a synchronized tape recorder with perforated recording tape. Such temporary freezing of immediate transmission is the traditional technique of creating artificial memory. But slowness of signal transmission in a channel itself can be considered and used for storage: "Die im Vergleich zur elektrischen Fortleitung langsame Schallgeschwindigkeit wird in Verzögerungs- oder Laufzeitstrecken zur Speicherung ausgenutzt."<sup>30</sup>
- "multi-modal" archive indeed: Acoustic media are not used for sound storage and transmission, but as a signal for the intermediate storage and recycling of pure data.
- Horst Völz differentiates between two forms of storage, dynamic and static: Storage of events in time and storage of momentary sections of time. Both are not categorically different but rather extreme limits of one and the same.

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29 Moles 1968 / 2011: 264

30 W. de Beauclair, *Rechnen mit Maschinen. Eine Bildgeschichte der Rechentechnik*, Braunschweig (Vieweg) 1968, 228

Inbetween is cinema: "Eine deutliche *Zwischenstellung* nimmt der *Kinofilm* ein. Hier werden in definierten zeitlichen Abständen Momentausschnitte des Geschehens festgehalten und später in dieser Reihenfolge wieder reproduziert."<sup>31</sup>

- electronic television image, which is a radical function of a volatile moment in time (a cathode ray "written" on the screen) on the one hand, and its interlaced half-images with a frequency of 50 Hz on the other, interrelates both modes

- in multimedia consumer market Saturn at Berlin Alexanderplatz, looking for fuses to repair an old television set, I discovered a shelf bookmarked "Archivierung". What is coined "archivization" here in fact simply means peripheral storage media like CD-ROM, DVD et cetera. I read this as an indication of the inflationary use of the term "archive" which has lost all his specific connotations until it blurs with the meaning of memory at all. The irony is that the archive means the opposite of what digital storage media promise: almost endless storage space, where the art of selection and of classification, of indexing and critical revision has been lost completely.

- different to libraries, traditional archive since Athenian times has not been about providing knowledge but rather to keep administrative data in juridical and legal latency. The archive has not even aimed at memory in the emphatic sense of cultural or so-called collective memory: On the contrary, once the archival documents become historic, they are not archivologically valid any more (like the Prussian Secret Archive after the end of the Prussian State in 1947); reading of archival records for historical research, in a sense, already a misuse of the archive

## **Mathematization of the archive**

- archive in the strict sense returns, even more rigorously than ever: in the form of the laws governing technological and electromathematical communication. Source codes, protocols reign on the level of programming languages in computers; so do the registers (an original archivological term) on the level of the central processing unit (CPU) within computer hardware. Physically and logically (that is: technologically) the archive rules in media culture, thus verifying Foucault's somewhat ideosyncratic definition of "the archive" in new forms even unseen by Foucault himself. Foucault's notion of the archive, like the epistemological aesthetics of his *Archaeology of Knowledge* on the whole, is closer to the generative grammar in linguistics, the logical calculus in logics and mathematics itself than to humanities.

The archival regime refers to the symbolic order (mainly alphabet-based); the audiovisual archive to the real recording of physical signals. With computed binary data, the symbolical regime returns, (alpha-)numerically.

- While electronic storage media in the age of the analog such as magnetic tape recorder for sound or data recording literally embodied an archive "in

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<sup>31</sup> Horst Völz, *Information I. Studie zur Vielfalt und Einheit der Information*, Berlin (Akademie) 1982, 139



motion" (the reel-to-reel dynamics acquired to access signals), the switch to non-linearly addressable storage media (the hard disc) let a discrete, abrupt, discontinuous, arithmetic regime return, closer to sampling than to continuous reading. Whereas the classical archive has been a timeless space, now time itself becomes mathematized (remembering of the etymological off-spring of "time" from indo-european roots meaning basically "cut", "divide")

- hidden from the public user, as "protected mode" in programmed computer chips. Archival enlightenment, once more (and in the sense thematized by Jean-Francois Lyotard in *The Postmodern Condition*), means unlocking this Foucauldean *archive*

## **Library, Archive, Médiathèque**

- "classified" = archival non-accessability; "de-classified" stamp

- Michel de Certeau links the storage of electronic data to the library: "Insofar as it is linked to the use of the computer, information science, between "input" and "output", organizes arrangements of symbols in reserved sites within a memory and transfers them to agreed-upn addresses according to instructions that can be programmed. It orders placements and displacements in a space of information which is not without analogy to the libraries of the past" = Michel de Certeau, *The writing of history*, New York / Chichester (Columbia University Press) 1988, chapter "Production of Places", note 60

In archives based on the provenance principle, the incoming documents are rather kept in their original order than re-distributed

- library catalogue follows a systematic order of content-oriented classification. In computer memory, though, the mathematization of addressing is complete

- Brewster Kahle's Internet "Archive" rather based on the library model: "In the future, it may provide the raw material for a carefully indexed, searchable library. The logistics of taking a snapshot of the Web 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."<sup>32</sup>

## **Motion and immobilization: the audiovisual archive**

- scripture-based classical archive = a static array of records on the grand scale and letters on the microscale; brought in motion only by the act of human reading line by line

- Edison phonograph the first form of "archive in motion", since its recording (notably the early ethnographic field recordings around 1900, leading to the Vienna Phonograph Archive and the Berlin Phonogramm Archive) is based on a

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32 Brewster Kahle, *Preserving the Internet*, in: *Scientific American*, vol. 276, no 3 / March 1997, 82f (82)

rotating, technically moving apparatus both in recording and in re-play; parallel to early cinematographical recording and projection. The recording of the acoustically or optically "real" physical signal as opposed to symbolic notation by the alphabet (the difference between physical signal and cultural symbol) *is* the archive in motion. But even if songs or movements are being recorded dynamically, they become frozen (immotion, becoming archive)

- Albert Lord on the recording of Yugoslav guslari song by the philologist Milman Parry in his effort to reconstruct the fabric of Homeric epic by analogy: unintentionally, technical recording created a "fixed" text. "Proteus war fotografiert worden [und] an dieser Aufnahme wurde hinfort jede Veränderung gemessen - sie wurde zum 'Original'." <sup>33</sup>

- electromagnetic recording preserves a unique feature of the oral performance in difference to its alphabetic, immobilizing transcription, which can be derived from how French language calls the recording device: *écriture magnétique*. Electromagnetic recording, in its very physical latency, only comes into existence as part of a dynamical process, the *inductive* act of re-play ("writing" different from "printing"). In his preface to Albert B. Lord's *The Singer of Tales* Harry Levin remarks: "The Word as spoken or sung, together with a visual image of the speaker or singer, has meanwhile been regaining its hold through electrical engineering." <sup>34</sup>

## Archive and motion

- first technological visual memory in motion has been cinematography: mechanically "moving stills", competing from its beginning in 1895 with an electro-mechanical vision of immediacy, live transmission, simultaneity - in fact television. Temporal immediacy *versus* temporally dislocated presence separates both "technologies of time". <sup>35</sup>

- "While in film each frame is actually a static image, the television image is continually moving, very much in the manner of the Bersonian *durée*. The scanning beam is constantly trying to complete an always incomplete image. Even if the image on the screen seems at rest, it is structurally in motion. <...> While the film frame is a concrete record of the past, the television frame (when live) is a reflection of the living, constantly changing present. <...> the filmic event is largely *medium dependent*, while television in its essence (live) is largely *event dependent*" = Herbert Zettl, *The Rare Case of Television Aesthetics*, in: *Journal of the University Film Association* vol. 30, no. 2 (spring 1978), 3-8, here quoted after: Jane Feuer, *The Concept of Live Television: Ontology as Ideology*, in: E. Ann Kaplan (ed.), *Regarding Television. Critical Approaches - an Anthology*, xxx (University Publications of America / American Film Institute) 1983, 12-22 (13)

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33 Albert B. Lord, *Der Sänger erzählt. Wie ein Epos entsteht*, München (Hanser) 1965, 185; AO: *The Singer of Tales*

34 Boston (Harvard University Press) 1960, xiii

35 See William Uricchio, *Technologies of time*. Draft version, forthcoming in: J. Olsson (ed.), *Visions of Modernity* (working title), Berkeley (University of California Press); <http://www.let.uu.nl/~william.uricchio/personal/OLSSON2.html>

- video closer to the time-critical nature of the electro-physical signal than to the conventional "image". The "movie" is - technically - a function of the archive (storage on celluloid, projected from reel), whereas the TV image has to be (re-)produced, re-freshed permanently; no substantial "ontology" of the tv image; only in memory it gets fixed (magnetic tape / video recording)

- motion brought into the immobile array of symbolic recordings in archival documents only by human act of reading, technological media, starting with literal "movies", depend on an apparatus processing the data in order to produce a document for human senses.

- Vannevar Bush's visionary anticipation of hypertextual storage and retrieval of records "As we may think" in 1945, similarly confronts the telegraphic facsimile transmission of texts or images with electronic television where "the record is made by a moving beam of electrons" for the reason of speed, combined with "a screen which glows momentarily when the electrons hit, rather than a chemically treated paper or film which is permanently altered"<sup>36</sup>. Beyond the Gutenberg era of imprinted letters, information becomes fluid, ephemeral, a temporary moment, a trace in time rather than a point in space, radically dynamic rather than discrete like a written or printed alphabetic letter.

- museum-like crystallization of temporal objects transforms to flow. Recycling instead of finality: the length of storage is becoming increasingly more short-term. ROM (long-term memory) is challenged by RAM, by random access. Final storage transforms into interim storage.

- for feedback-based, interactive "memory" in the telematic society, memory-model of the archive is not apt any more

- within context of technical media, term "memory" itself better conceived in cybernetic terms (such as feed-back and recycling, latency and re-activation) than in the tradition of semantics. Neurological science has discarded the emphatic notion of memory in favor of models describing accelerated forms of information exchange.

- not conflate human (associative) memory with techno-logical (i. e. numerically addressable) storage: "A memory function remembers the same response to the same signal: a counting function counts it different each time"<sup>37</sup>

- Vannevar Bush's vision "As we may think", in *Atlantic Monthly* in July 1945, argues for a memory and information retrieval system based media-archaeologically on linkable microfilm, and conceptually rather emulating the associative mechanism of human recollection than the structural classification trees of library catalogues. The difference between memory and storage is not the opposition of humans *versus* machines, but much more a conceptual one

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<sup>36</sup> Vannevar Bush, As we may think, in: *Atlantic Monthly* vol. 176 (1945), 101-108; here quoted after the reprint in: A. J. Meadows (ed.), *The origins of Information Science*, London (Taylor Graham) 1987, 254-261 (256)

<sup>37</sup> George Spencer Brown, *Laws of Form*, xxx, 65

which refers to both: "When data of any sort are placed in storage they are filed alphabetically or numerically, and information is found <...> by tracing it down from subclass to subclass. <...> The human mind does not work that way. It operates by association. With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain. <...> trails that are not followed frequently followed are prone to fade, items are not fully permanent, memory is transitory" = Vannevar Bush, *As we may Think*, in: *Atlantic Monthly* vol. 176 (1945), 101-108; here quoted from the reprint in: A. J. Meadows (ed.), *The Origins of Information Science*, London (Taylor Graham) 1987, 254-261 (259)

- "memory is transitory"; electronically with the vacuum tube and finally the transistor computer memory operates at the speed of electricity itself

- Random Access Memory a challenge to one of the most central imperatives of the archive, that records may be kept (at least in principal) permanently; suddenly a media culture where the fading away of records is not only seen as a technological deficiency, but on the contrary is an in-built feature of a new memory culture

- Bush insists: "Selection by association, rather than by indexing, may <...> be mechanized" <ibid.>, and consequently he designs a sort of private library machine called at random "memex", a memory extender

## **The internet "archive"**

- difference between the classical and the hyperspatial archive is its dynamics. Such is the use of the term "archive" in the internet, indicating its shift of emphasis on realtime or immediate storage processing, on fast feedback

- categorical difference between historic "archival" time and immediate online-time

- 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 own 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."<sup>38</sup>

- Internet "archive" becomes radically temporalized; 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 / the openness / the online-availability of (multimedia) archives

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38 "Information and archives on the Internet", <http://www.hensa.ac.uk/www94/internet.html>

- "We plan to update the information gathered at least every few months. <...> In future passes through the Web, we will be able to update only the information that has changed since our last perusal" = Kahle 1997: 83

- "In the digital age, storage space is no longer the main problem, the problem is rather time. We are not only collecting static objects such as books, but also literally *streams of information* such as the television, the radio and finally the internet. With the internet these streams are radicalized in the sense that these texts or rather new media objects are fluid and unstable entities very often continually updated and replaced."<sup>39</sup>

- radical non-archival nature of Internet memory, while the juridical function of the institutional archive is exactly to secure that the record does not change, such as the legal system itself is based on long-term claims rather than permanently be rewritten or updated

## Dynamic memories

- not only search tools, but targets of research become dynamical: We come closer to the dynamically generated information in the Internet. "Born digital" means algorithmically dynamic

- David Gelernter argues for a replacement of the space-oriented, "archival" desktop metaphor for computer interfaces by a time-based data field: "The Lifestreams system treats your own private computer as a mere temporary holding tank for data, not as a permanent file cabinet. It takes over management of the main memory and disk on your local machine" = David Gelernter, *Machine Beauty*, New York (BasicBooks) 1997, 106

- from a cultural aesthetics of storage to an accelerated notion of "delayed transfer" (alluding to a term by Jack Goody)<sup>40</sup>

- digital media as such from the beginning a function of dynamic storage by their very nature, since digital calculation, like all advanced mathematics, needs inter-temporal storage for inbetween-data.

- George R. Stibitz in his Memorandum from 23 April 1942 on "Digital Computation for a. a. <sc. anti-aircraft> directors": "Digital computers introduce a consideration not found in kinematic analog computers, namely the ordering of computation steps in time"; Stibitz refers to the "number train" of zeroes and ones. "Digital computation is dynamic in character" = *ibid.*; quoted from Robert Dennhardt, *Die Flipflop-Legende und das Digitale*, Berlin (Kulturverlag Kadmos) 2009, 157

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<sup>39</sup> Eivind Røssaak, *The National Library and the Digital Age*. Paper delivered at the seminar, *Words*, arr: Du store verden! Oslo, 20th September, 2008

<sup>40</sup> 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, München / New York (Prestel) 1997, 174-176

- nostalgia for archival order = a phantasm surviving from the age of print / classificatory order. "Entropic" data trash is, positively, the future ground for media-anarchaeological excavations<sup>41</sup>

- instead of thinking the archive in terms of order by classification: entropical thinking, that is: allowing for the highest degree of disorder, which contains, in communication theory, the highest degree of (possible) information

- Ruskin's 1884 lecture *The Storm-Cloud of the Nineteenth Century* finds in the weather a thermodynamic phenomenon which brings into play "order by fluctuation, a form of order understood as process rather than state" = Richards xxx

- analysis oscillates between the micro- and the macrophysical level. Cloud modelling (developed for weather forecasting) is the name of the challenge to answer this anarchic dynamics by fast calculation (notably advanced methods such as multirate time integration, time stepping and massive parallelization as condition for numerical computations such as spectral cloud microphysics).<sup>42</sup>

- diagrammatic machines; different from the archival diagram (Deleuze on Foucault): additional dimension of temporal processes.

- data flow to be kept intact is not the file transfer of bureaucracy but the algorithms of computer-based data processing

- chrono-photography (Muybridge, Marey): catch the dynamic element in movement, the kinetic

- Gateway to Archives of Media Art (GAMA) primarily dedicated to *ephemeral* forms of art = <http://www.gama-gateway.eu>; both to the artistic (performances) and the techno-electronical form ("variable media")

### **Archival resistance: the un-movable**

- message of the storage medium is no longer the alphabet. Dynamic access replaces the static classification of the traditional catalogue, just like statistical probabilities replace particular knowledge in information theory (and pattern recognition replaces alphabetical identification):

- From the question of how to archive performance results the performative archiv: actualisation in form of re-enactments

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41 Links to recycling: the Redundant Technology Initiative (<http://www.lowtech.org>) and Mark Napier's [www.potatoland.org](http://www.potatoland.org)

42 See f. e. the project *HPC for Detailed Cloud Modeling* (Leibniz Institute for Tropospheric Research, Leipzig, and Centre for Information Services and High Performance Computing, University of Dresden): <http://www.tu-dresden.de/zih/clouds>

## Archival tectonics

- increasing temporalization of the "archive" which has previously been static; "structure" (tectonics) has been the archival essence *per se*. Vector now: the "dynamic" / "algorithmic" archive

- against intellectual or artistic phantasies of "the anarchival"<sup>43</sup>, the digital archive still rigorously rooted in its techno-mathematical structure

While in public discourse the archive is mostly (mis-)understood as the "content" of the archive (its records, its data banks), in archival sciences the term rather refers to the organizing structure.

- media-archaeological examination of the "digital archive" as computational instantiation of a long archival tradition: a negotiation between the symbolic order (administrative records) and its implementations. An archaeology of knowledge in Foucault's sense focuses on the disruptions which separate the technological archive from the traditional institutional archive. The traditional archival record has always been "digital" in the sense of discrete strings of symbolic characters, predominantly written in the phonetic alphabet. But what is termed "digital" today rather refers to the binary code and its organization by mathematical algorithms, embodied in the processual computer. Since this binary code encompasses the processing not only of alphabetic texts or numerical mathematics but sound and images as well once such audiovisual signals have been sampled and compressed, all of the sudden the archival regime extends beyond classical textuality. Therefore, digital storage resources ask for a conceptual re-evaluation of the archive. As explicitly expressed in Jacques Derrida's booklet *Archive Fever*<sup>44</sup>, technology changes the structure of the contemporary archive. But while Derrida fails to address this technical change precisely, it can be techno-mathematically named: operating systems, algorithms and source code, in combination with *specific* hardware *architecture*, constitutes the new "two bodies" (alluding to Kantorowicz) of the contemporary "digital archive"; there is no single universal computer, but only computers as concrete implementations of the Turing Machine (Stefan Höltgen)

## Media archivology

- technological archive, once conceived as essentially the processual score, is the *operative diagrams*; Charles S. Peirce's definition of "diagrammatic reasoning"<sup>45</sup>

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43 See Claudia Giannetti (ed.) / Eckhard Furlus (editing), *AnArchive(s)*. Eine minimale Enzyklopädie zur Archäologie und Variantologie der Künste und Medien, Oldenburg (Edith-Russ-Haus für Medienkunst) 2014

44 Translated by Eric Prenowitz, Chicago (University of Chicago Press) 1998

45 See Frederik Stjernfelt, *Diagrammatology. An Investigation on the Borderlines of Phenomenology, Ontology, and Semiotics*, Dordrecht (Springer) 2007

- Foucauldian archivology remains space-centered, topological "other spaces". Such analyses autopoietically refer 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."<sup>46</sup> With the age of so-called analogue (technical) media such as the phonograph and cinematography, signs of/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 *dialectically* re-returns: this time in a genuinely dynamic mode (which differentiates implementation of software from the traditional Gutenberg galaxy): algorithmic time, operative diagrams

- navigating sound and images by digital addressability: by-passing 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 not meant to be a metaphor; for Michel Foucault, the term archaeology explicitly "does not relate analysis to a geological excavation".<sup>47</sup> What is being digitally „excavated“ by the computer is a genuinely code-mediated gaze on a well-defined number of information patterns which human perception calls "sound" or "images"

## TEMPOR(E)ALITIES OF THE ARCHIVE

### **The negentropic effort**

- Shannon defines artificial languages "a stochastic process which generates a sequence of symbols"<sup>48</sup>; Max Bense's computer-generated *Monolog der Terry Jo*

- Ian Hamilton Finlay chiseled in separate stones the inscription: THE/PRESENT/ORDER / IS/THE/DISORDER / OF/THE/FUTURE / SAINT-/JUST. "Cut around outlines. Arrange words in order", the *subscriptio* adds to the photographic reproduction of this ensemble<sup>49</sup>

- archival order, corresponding with the library ratio of classification, a function of the political "state" which is the symbolic order (Lacan). Since the emergence of c19 statistics, mathematical culture allows to deal with the

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46 Friedrich Kittler, *Gramophone - Film - Typewriter*, Palo Alto, Cal. (Stanford UP) 1999, 5

47 Foucault 1972: 129

48 Claude Shannon, *Collected Papers*, Piscataway (IEEE Press) 1993, 5

49 See Yves Abrioux, Ian Hamilton Finlay. *A visual primer*, Edinburgh 1985



virtual, that is: calculated an-archive of entropy/information in a way beyond the conservative desire of reducing it to order/"negentropy" again (Shannon vs. Wiener). Data trash is, positively, the future ground for media-*an*archaeological, that is: stochastic/algorithmic excavations.<sup>50</sup> ; see Constant, *Preliminary Works Towards an Online Archive* of Erkki Kurenniemi's collection of private data, presented at Documenta Kassel 2012; see chap. 9 "Archiving the Databody: Human and Nonhuman Agency in the Documents of Erkki Kurenniemi", in: Krysa / Parikka (eds.) 2015, 125-141

- between Shannon entropy and Boltzmann entropy, two different tempor(e)alities at work here: a) information time, invariant towards historical change, and b) physical time ("tempus edax" known from allegories of Chronos in the Baroque)

- archive(s) with and without "s". In French, 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 Kantian notion of a condition of something to be articulated at all. For the case of the Internet, this is communication protocols - "[d]ie Regeln, nach denen die Kommunikation zwischen Computersystemen abläuft"<sup>51</sup>.

- Martin Kusch, Discursive formations and possible worlds. A reconstruction of Foucault's archeology, in: *Science Studies* 1/1989, 17-25

- thread to traditional library classification is not fire or violence algorithms; in software, they metaphorically return as programm *libraries*

- chrono-photography (Muybridge, Marey) samples the dynamic element in movement, the kinetic; late 19<sup>th</sup> century, the scientific urge to store and analyze temporal phenomena culminated in phonograph and film; forms of "archive in motion", since its recording (notably the early ethnographic field recordings around 1900, leading to the Vienna Phonograph Archive and the Berlin Phonogramm Archive) is based on a rotating, technically moving apparatus both in recording and in re-play

### **Archival emergency and the cold archaeological gaze: *Quick freeze***

- "quick freeze" as a practice in data surveillance and telecommunication economy rather halts than stores volatile data punctually for a short temporal interval, a kind of memory "interrupt", legally permitted only in case there is a justified suspicion

- cooling down films rolls to withstand decay with time (physical entropy); vocabulary of storage media very much a language of temperature"; technique of so-called freeze frame media-epistemologically important, "cinema's

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50 On recycling, see the Redundant Technology Initiative <http://www.lowtech.org> and Mark Napier's [www.potatoland.org](http://www.potatoland.org)

51 Othmar Kyas, *Internet: Zugang, Utilities, Nutzung, Bergheim (DATACOM)* 1994, 61

negotiation with time" = cfp conference *Archives of the Arctic. Ice, Entropy and Memory*, Humboldt University, Berlin, September 18 to 21, 2013

- 2002, water flooding caused by heavy rain in the Tchech Republic damaged archives as well. Great amounts of the wet archival records were transferred to the Mochov Refrigeration Plant which originally served for freezing vegetables, in order to delay their decay by water: "The natural disaster of the floods interfered with this continuous historical interpretation by silencing the archives and erasing many pieces of 'evidence'. Many documents [...] have been frozen and will remain so for decades."<sup>52</sup>

- in administration of "big data", "quick freeze" - term taken from preservation of nutrition (*Schockfrost*) - a preservation order, an administrative *Speicheranordnung* to prevent the almost immediate erasure of telecommunication data in companies just in case there is need to de-freeze them for legal investigation - the suspended ephemeral, the interval

- analog signal storage: so-called "archival tapes" (magnetophonic records) in broadcast archives (radio, television) need to be gently heated up to de-coalesce in order to play them again for copying, digitizing and migration - literally de-freezing memory from the temperature-controlled room in the Yale archives.<sup>53</sup>

- storing digital data carriers in ultra-low temperatures (be it a refrigerator or an iceberg) exponentially increases the probability for undamaged preservation; "arctic" digital memory

### **Towards the chrono-archive? Internet tempor(e)alities**

- "real-time web" = set of technologies and practices which enable users to receive information as soon as it is published by its authors, "rather than requiring that they or their software check a source periodically for updates"<sup>54</sup>

- real "message" of the online communications format *instant messaging*, in McLuhan's sense, is the immediacy of the character strings, the effect of a pseudo-co-presence between sender and receiver; "cyberspace" becomes cyber-contemporaneity. "Früher ging es um die Schaffung von Räumen <...>, heute geht es um die Zeit selbst, um Chronos, um die Kunst der *longue durée*."<sup>55</sup> The Internet is a chrono-technical compression of time ("Verdichtung von Zeit", *ibid.*). Suchmaschinen wie Google haben längst darauf reagiert, indem sie Seiten in Echtzeit auswerten und an die Nutzer rückkoppeln. Insofern

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52 Jiri Sevcik, Dagmar Svatosova, Eva Kratka, *Silenced Archives*, in: *Gegenwart dokumentieren / Archiving the Present*, hg. v. Lioba Reddeker, Wien (Eigenverlag basis wien) 2006, 260f (261)

53 On "frozen" electro-magnetic signals see: Christian Koristka, *Magnettonaufzeichnungen und kriminalistische Praxis*, Berlin (Ost) (Ministerium des Innern, Publikationabteilung) 1968

54 [http://en.wikipedia.org/wiki/Real-time\\_web](http://en.wikipedia.org/wiki/Real-time_web); accessed 20th January, 2010

55 Geert Lovink, *Was uns wirklich krank macht*, in: *Frankfurter Allgemeine Zeitung* Nr. 140, 21st June, 2010, 27

nicht vorherbestimmbar ist, ob und wann eine Antwort erfolgt, unterscheidet sich dieses Echtzeit-Netz grundsätzlich von Echtzeitberechnung im Computer:

- real-time computing (RTC), or "reactive computing" = study of hardware and software systems that are subject to a "real-time constraint"—i.e., operational deadlines from event to system response. By contrast, a *non-real-time system* is one for which there is no deadline, even if fast response or high performance is desired or preferred; synchronous programming languages provide frameworks on which to build real-time application software. "A real time system may be one where its application can be considered (within context) to be mission critical"<sup>56</sup>

## CHRONOPOETICS OF TECHNO-ARCHIVAL MEMORY

### **Non-narrative archival time layers**

- storage as catechontic delay time of access: "Die Festungen *schützen Raum und gewinnen Zeit* <...>"<sup>57</sup>; with the acceleration of transport and communication media a shift of emphasis from emphatic long-time preservation to ultra-short intermediary storage, as effect of electronic media culture. 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"<sup>58</sup>, less concerned with records for eternity but with order by fluctuation

- interconnection through real time flows give unprecedented priority to the present; memory in the age of electro-mathematical media has become transitory

- 19th century photography: "Although individual sequences of pictures were often organized according to a narrative logic, one sees clearly that the overall structure was informed not by a narrative paradigm, but by the paradigm of the archive. After all, the sequence could be rearranged; its temporality was indeterminate, its narrative relatively weak. The pleasures of this discourse were grounded not in narrative necessarily, but in archival play <...>" = Sekula 1985: 58

- "There was a time when archaeology, as a discipline devoted to silent monuments, inert traces, objects without context, and things left by the past, aspired to the condition of history, and attained meaning only through the restitution of a historical discourse; it might be said, to play on words a little, that in our time history aspires to the condition of archaeology, to the intrinsic

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<sup>56</sup> [http://en.wikipedia.org/wiki/Real-time\\_computing](http://en.wikipedia.org/wiki/Real-time_computing); accessed 7th January, 2010

<sup>57</sup>E. v. H., *Die Festungen in der modernen Kriegsführung*, in: *Im Neuen Reich*, 1 (1871), 53

<sup>58</sup>Tjebbe van Tijen, *We no longer collect the Carrier but the Information*, interviewed by Geert Lovink, in: *MediaMatic* 8#1 (translation: Jim Boekbinder)

description of the monument"<sup>59</sup>; media archaeology counts with re-configurations and feed-backs rather than continuous developments

- before the archive: the intermediary, well known from electronics. Registers in the techno-mathematical sense (as a term in archival science) are binary relays (either electro-mechanical or fully electronic) in a calculator for *transient* storage of digitally represented numbers<sup>60</sup>; "Colossus had to 'remember' a bit for a split second until its neighbour arrived. For this task, it used a bank of capacitors which it charged up and discharged as needed."<sup>61</sup>

- commercial trading logistically knows so-called *chaotic storage administration*; on computer discs as well / storage medium Compact Disc: data are interlaced: not sequentially in their temporal sequence, but dissipative; micro-dramaturgy of electronically addressing stored data

### **The diagrammatical archive**

- strength of the traditional archival method of sorting records = non-verbal analysis of administrative and infra-structures; kind of diagrammatic reasoning of administrative memory

- technical media, once conceived as essentially *processual*, are operative diagrams

- archival record management close to the "algorithmic" (provenance, keeping track of genealogies and procedures), different from the arbitrary museum or library collection (corresponding with the "pertinence" of data banks). That is why orientation within the archive is based upon the "repertory" rather than on symbolical search engines like the library catalogue; it reveals structures, not objects

### **Towards "A mathematical theory of archival communication"**

- notion of archival transmission already implies an intentional act, an addressing of posterity - to which the historian (researching in the archive) places himself as the destinee. The term "sending" here can be understood not as destiny in a metaphysical way but as a concrete act of mailing, corresponding as an act of transmission engineering with what Walter Benjamin has called the "historical index" (when images from the past are indexed with an implicit time code: "The past 'carries with it' a temporal index: the date of its emergence and of its expiration. <...> The address of the past in all its power *will have been* if it is read by the present that it enables; if it is not, it disappears without a trace. <...> Benjamin always thought the address of truth in historical (or at least temporal) terms; translatability, after all, comes about

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<sup>59</sup> Michel Foucault, *Archaeology of Knowledge*, transl. A. M. Sheridan Smith [\*1972], London / New York (Routledge Classics) 2002, "Introduction", 3-19 (7f)

<sup>60</sup> "<...> die vorübergehend eine Zahl speichern können": A. Huber, *Programmgesteuerte elektronische Rechenmaschinen*, in: *Funk-Technik* Nr. 24/1957, 828-830 (828)

<sup>61</sup> Barry Fox / Jeremy Webb, *Colossal Adventures*, in: *New Scientist* Nr. 1081 vom 10. Mai 1997, 39-43 (41)

only in time and for a time, and translation is not a mere transcription" = Christopher Fynsk, *The Claims of History*, in: *diacritics* vol. 22, fall/winter 1992, 115-126 (123ff); see Walter Benjamin, *Gesammelte Schriften*, Bd. V.1, 577 f.

- minimizing risk of errors in manual copying of charts by radical "digitization" (Alberti); Mario Carpo, "Descriptio urbis Romae". *Ekphrasis geografica e cultura visuale all'alba della rivoluzione tipografica*, in: *Albertiana*, Florenz (Olschki) 1, 1 (1998), 111-132. From that practice results an ahistoric form of tradition, nowadays known from the archival rescuing projects of digitizing endangered historic manuscripts

- in terms of communication engineering, electric (discrete, "digital") impulses clearly identified, filtered and regenerated in the channel than the continuous wave form, against distortions or noise = see Roch 2009: 102; therefore the former amplifier has been replaced by the *repeater-regenerator* (relay), allowing for almost invariant signal transmission. "By using binary (on-off) PCM, a high quality signal can be obtained under conditions of noise and interference so bad that it is just possible to recognize the presence of each pulse <...> almost independent of the total length of the system" <ibid., 154>. The formerly familiar noisy distortions in the channels of cultural tradition and communicative transmission are replaced by noise at the signifiers (signals) themselves: the "signal-to-noise ratio in PCM systems is set by the quantizing noise alone" = *ibid.*, 155

- "We may assume the received signal  $E$  to be a function of the transmitted signal  $S$  and a second variable, the noise  $N$ . <...> The noise is considered to be a chance variable just as the message <...>. In general it may be represented by a suitable stochastic process"<sup>62</sup>;  $E = f(S, N)$ , to be supplied by the temporal axis as signal delay within the channel  $E = f(S, N, \Delta-t)$ . There is time within the signal already: "In all communication engineering <...> the message to be transmitted is represented as some sort of array of measurable quantities distributed in time. <...> by coding, or the use of the voice, or scanning, the message to be transmitted is developed into a time series"<sup>63</sup>

- in case of storage, the signal is arrested ("received") in the channel itself:  $E = f(S, N, t_1)$ , for arbitrary reading at a later time

- "The basic proposition of cybernetics that signal = message + noise, and that the message, and not the noise, is the sensible term in communication, is applicable in all sorts of contexts <...>. Wiener is the signal, and for us the Wiener-message, and not the Wiener-noise, must be of significance." <Masani xxx: 19>

- "This is the study of messages, and their transmission, whether these messages be sequences of dots and dashes as in the Morse code or the teletypewriter, or sound-wave patterns as in the telephone or phonograph, or

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62 Claude E. Shannon, *The Mathematical Theory of Communication* [1948], in: *ders. / Warren Weaver 1963: 29-125 (65)*

63 Norbert Wiener, 1942, *The Extrapolation, Interpolation and Smoothing of Stationary Time Series with Engineering Application*, typescript dated 1st February, 1942, 3: National Archives and Records Administration, Record Group 227 (Office of Scientific Research and Development), College Park, Maryland (USA), MFR, DIV.7-313.1-M2. See Roch 2009: chap. 2.4 "Statistik gegen Geometrie", 61 ff.

patterns representing visual images as in telephoto service and television. In all communication engineering <...> the message to be transmitted is represented as some sort of array of measurable quantities distributed in time. <...> by coding, or the use of the voice, or scanning, the message to be transmitted is developed into a time series."<sup>64</sup>

- transmission and storage interlaced, as defined in the invention of magnetic sound recording by Oberlin Smith in 1888: "Imagine that speech could be transmitted over a telephone line at a very slow 'rate of travel', so that at a particular point in time the entire message would be somewhere in the wire between speaker and listener"<sup>65</sup> - close to reverberative delay lines in early electronic computing

- "If it were possible to 'freeze' this situation" - as described in *Münchhausens Abenteuer*, "the effect would be to store or fix the message, to have recorded it converting a time function into a place function" - a transformation into *archive*

### **Archives becoming time-critical**

- time it takes for access to records in the electronic archive, as opposed to the procedures in the institutional archive, shrinks to a momentary flash

- once material carriers are provided with a time code for non-linear access to single frames in archives of moving images, memory itself becomes a function of its techno-mathematical encoding (and compression)

- new vanishing point of archival theory in its temporal disposition

### **From space-based to time-based archives**

- three-step model of the evolution of memory in occidental society: first the mnemotopic, that is: really and imaginary space-based memory (the rhetorical *ars memoriae*); second the mass-media based communication which is rather based on actuality than on memory recall; third the contemporary and future online communication where both archival memory and "live" actuality are being replaced by the aesthetics of powerful search engines, "algorithmic memory", which is a coupling of human queries with machine "remembrance"<sup>66</sup>

- an active digestion rather than passive memory-*Gestell*, following G. W. F. Hegel's distinction between mechanic *Gedächtnis* and interiorized, now mathematical-procedurally appropriated *Erinnerung*) = Wolfgang Hagen, Hat das Internet ein soziales Gedächtnis? Anmerkungen zur medialen Struktur von Erinnerung und Vergessen, lecture given at Leuphana University in Lüneburg (Germany), December 3, 2010; for the actuality paradigm of print and electronic broadcasting media: Elena Esposito (following Niklas Luhmann's systems theory of communication), xxx; for algorithmic memory of search memory, Google Page Rank algorithm

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<sup>64</sup> Typescript Wiener 1942

<sup>65</sup> Friedrich Karl Engel, A Hundred Years of Magnetic Sound Recording, in: Journal of the Audio Engineering Society, Vol. 36, No. 3 (März 1986), 170-178 (171)

<sup>66</sup> .

- Michel de Certeau's "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.

- 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. Critically the archive transforms from storage-space to storage-time; only transitorically it can deal with streaming data in electronic systems. The archival data lose their spatial immobility the moment when they are being provided with a truly temporal index ("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. Cyberspace is an intersection of mobile elements, which can be transferred 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 feedback.

- audio-visual archives themselves take place in time, beyond the scriptural regime. AV media phenomenologically address humans on the existential level of their temporal sense. They re-generate temporal experience, thus addressing the human on the sensory (aesthetical, physiological) level as radically present, while our cognition puts it into a "historical" context: here, a dissonance takes place, a gap opens, a *différent* in Jean-François Lyotard's sense (referring back to Kant)

### **Sorting sound and images: between signal-based similarity and symbol-based logocentrism (George Legrady)**

- *Pockets Full of Memories* = online and museum installation by media artist George Legrady in which the audience *creates* a collection by contributing a scanned image of an object in their possession to a projected data bank; a similarity-oriented algorithm (SOM) "translates the Keywords (semantic information) and Object Description, and turns them into numbers which 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. In a technologically updated version called *Cell Tango*, Legrady (with Angus Forbes) displays a collection of constantly changing cellphone photos sent by individuals to [pix@celltango.org](mailto:pix@celltango.org), projected rhythmically over a large, black screen in a variety of patterns. Fresh snapshots swiftly adjust to that mosaic according to 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. In one of the four modalities of the installation, "Cell\_Bin", first the most recent images are placed on the black

screen, and an algorithm randomly distributes them. The space left in between is successively filled by smaller incoming photographs. This loosely coupled patterns evolve dynamically = the opposite of the traditional archival structure which preserved structures statically (i. e. "monumental"). In fact, the traditional archive derives its very authority from the "veto" against permanent change, such like a book which is meant to last for decades is a rock of enduring knowledge against the permanent up-dating of Wikipedia articles

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

- intermediary storage as necessary precondition for calculating the immediate future from memory of the immediate past - the extended presence in time of digital media. In July 1942 Norbert Wiener (with Bigelow) produced a (then secret) paper on *The Extrapolation, Interpolation and Smoothing of Stationary Time Series with Engineering Applications*<sup>67</sup>. The notion of "preemptive scheduling" was already known to denominate micro-temporal as well as macro-temporal process commands in factory production, but here it dealt with signals coming from the "echoic" present. Historic thinking assumes an infinite or very long period in the past on which to base its prediction. "A real target, by contrast, could be tracked for only a few seconds before the prediction was needed. Starting and stopping the system in a finite time interval introduced noise spikes at the ends of the time series, which corrupted the prediction. <...> if the shell did not explode within about 10 yards of the target, it was worthless <...>."<sup>68</sup>

- emphatic, apparently "deep" dimension of a macro-temporal process is thus being condensed into a series of temporal moments

- epistemologically delicate situation arrived with the anti-aircraft artillery in WWII, when the "enemy" pilot was expected to try to manoeuvre around the artillery trajectories. The artillery thus has to anticipate not only the immediate future position of the enemy aircraft, but as well the possible counter-manoevres of the pilot to escape this linear prediction. For that reason, a modification of the trivial pre-calculated fire tables has been developed which lead to the rise of a mighty technomathematical tool: the electronic analog, then: digital computer

- in pre-printed or materially pre-impressed mathematical firing tables, relation between in- and output a mechanistic one. When this calculation is meant to takes place just in time, additional aberrations (of the missiles et al.) require that the mechanism is ready and capable for immediate correction by signal feedback (analog computing, real-time digital calculations). "The computer performed <...> *prediction*, or leading the target, modeled its motion and extrapolated it to some time in the future. Second, the *ballistic* calculation

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<sup>67</sup> Norbert Wiener, *The Extrapolation, Interpolation and Smoothing of Stationary Time Series with Engineering Applications*, DIC Contract 6037 (National Defense Research Council, Section D), Division 7 Report to the Services No. 19, OSRD No. 370, Massachusetts Institute of Technology, Cambridge, Mass., 1. Februar 1942

<sup>68</sup> David A. Mindell, *Between Humans and Machine. Feedback, Control, and Computing before Cybernetics*, Baltimore / London (Johns Hopkins University Press) 2004, 280



figured how to aim the gun to make the shell arrive at the desired point in space and explode" <Mindell ebd.>.

- figure of time here is the grammatical "future in the past", based on a feedback operation: The director multiplied the calculated velocity of the target by the prediction time "to determine a future target position and then converted the solution back into polar coordinates for output" <89>. Thus the machine represented a worldly, that is: timely process by a physical model (that is: the analog computer). In order to do so, the classical firing table data were mechanically fed into this computer as a kind of permanent memory, "roughly comparable to what today we would call *ROM*, or read-only-memory" <89>. "Together, ballistic and prediction calculations formed a feedback loop" <ebd.>. The operators first entered an estimated time of flight for the shell when beginning the track. After an initial calculation, "the output of the ballistic calculation <...> fed back an updated estimate of the time of flight, which the predictor then used to refine the initial estimate" <89> - a cumulative, integrating cycle of (re-)corrections, with the aim of minimal dependance on the so-called human element

- analytic term for such a temporal extension is trajectory; difference between machine time and human time<sup>69</sup> is included in the cybernetic model

- micro-temporal data compression an agency in contemporary image communication, notably in streaming video where a series of images is not given like in cinematography any more but has to be algorithmically re-created every given moment.<sup>70</sup>

- 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 this is known as the echo of tones; visual stimuli result 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 signal (protention).

- 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-length 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 reconstructed at the decoding end of the process."<sup>71</sup>

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69 Name June Paik, Norbert Wiener und Marshall McLuhan, in: idem, xxx, 1992, 123-127 (125)

70 "One important method of transmitting messages is to transmit in their place sequences of symbols": David A. Huffman, A Method for the Construction of Minimum-Redundancy Codes, in: Proceedings of the I.R.E. (September 1952), 1098-1101 (1098)

## Order in fluctuation?

- from statistics (memory) to stochastic time series analysis (dynamic remembrance); Claude Shannon - in terms of technomathematical engineering of communication - defines artificial languages "abstractly [as] a stochastic process which generates a sequence of symbols."<sup>72</sup>

- with algorithmic administration and access, memory 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. As the abstract of the festival *Re-\*. Recycling\_Sampling\_Jamming. Künstlerische Strategien der Gegenwart* (Berlin, Akademie der Künste, 26-28 February 2009) declares, the richness of online-accessible text, sound and image repositories has resulted in cycles of re-appropriation; [www.recycling-sampling-jamming.de](http://www.recycling-sampling-jamming.de)

- in digital memory, not only the archival records themselves but its archival infrastructure becomes subject to increasing speed of up-dates; the traditional "time base" of archive itself becomes a function of temporal change (requiring a "differential analysis of second order", to speak mathematically and alluding to Norbert Wiener's cybernetic concept of "linear prediction")

## Conflicting archival tempor(e)alities: Symbolic order vs. indexical signal

- symbolic order according to Jacques Lacan already implies the machinic; Friedrich Kittler, [Ordnung des Symbolischen / Welt der Maschinen], in: same author, *Draculas Vermächtnis. Technische Schriften*, Leipzig (Reclam) 19xx

- conventional archival records consisted of strings of symbols (i. e. alphabetic writing); 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; once photography, the first medium in its modern sense, becomes object (or even subject) of the archive, the sense-affective, presence-generating power of signal-based media cuts short the cognitive distance; Hans Ulrich Gumbrecht, *Production of Presence. What Meaning Cannot Convey*, Stanford University Press 2004

- while media archaeology describes the non-discursive practices of the technocultural archive, media phenomenology analyzes "how phenomena in various media appear to the human cognitive apparatus", mind and senses" =

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71 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)

72 Claude Shannon, *Collected Papers*, Piscataway (IEEE Press) 1993, 5

Jakobsen 2010, 127-154 (141), referring to Chun & Keenan 2006, 3-4; cybernetic A/D-sensors, "Perceptron"

- "bias" = originally technical term in electronic engineering describing the necessary electric tension to operate a vacuum tube (esp. triode) - a literally pre-conditioning, a ground tension for making the circuitry work at all, an electric *arché*; for magnetic recording, the "bias" names the pre-magnetization of the tape by high frequency signals to ameliorate the signal-to-noise ratio (dynamics); proper informative time signal thus overlaid or pre-conditioned by a different *a priori* temporality.

### **Archival tectonics vs. signals in/of motion**

- cinematography does not concentrate on the single image like photography but unfolds inter-frame coherence (even if katachretic), revealing relational qualities otherwise hidden (Foucault's definition of discourse analysis)

- Edison phonograph itself "in motion"; its recording (resulting in the Vienna Phonograph Archive and the Berlin Phonogramm Archive) is based on a rotating, technically moving apparatus, and in re-play

- once digitized and coupled to online accessibility, the archive is no longer an institution of administrative memory set apart from the current operations, but rather returns to the registry as "echoic memory" extension of the present itself, coupled to actual processes in feedback loops which result in periodic updating (different from inscription which used to remain unchanged). With digital storage, institutionally stable record repositories are increasingly replaced by dynamic files *in motion*. While in pre-"online" 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 separated from the working office, a place to sort and select records for long-time legal claims), today the archive merges with the register itself

### LIQUEFYING THE ARCHIVE

#### **DEAF 03 "Data Knitting"**

- as digital format, image is not simply integrated into an archival structure any more, but itself constitutes an archive; it can be "an interpreted composition of pixels, a collection of statistics, lines of contours or directions, a music score" = E. K. (In 2048)

- "even secret files suffer a loss of power when real streams of data, bypassing writing and writers, turn out merely to be unreadable series of numbers circulating between networked computers."<sup>73</sup>

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<sup>73</sup> Kittler, Gramophone 1999, Preface xxxix f.

- "We are permanently living in archives: All the sites we visit on the Internet are logged by our search engines. All our shopping is registered by our supermarkets. Each time we perform an electronic act we add information to the running archive of our activities as both individuals and members of target groups. On the basis of such archives the policies for the future are being planned [...]."

Ekstasy of the archive means its being connected *online* to any present computer-based action (Wireless LAN for example); this means first electrification (speed of light) and second binary mathematization.

- once instantaneously available and accessible, archives become an essential factor in acting in the present. [...] Archives are becoming just as process-like in character as the present already is. The individual's experience of the present can be increasingly described as the moment when an "unforeseen" link is forged between tagged information clusters that reach him or her through the media. [...] What role does the individual play in this?"

- search engines designed to identify "the proverbial needle in the haystack. A digital archive, like neuronal memory, need not be a static system. Memory is something that operates in the present and through that act is continually updated. Research into such functions of memorizing or information storage provides not just interesting knowledge in its own terms, but also models and tools for understanding the possibilities of nonlinear computing and nonlinear database linking technologies"

### **Active Archives (Exposé Workshop)**

- since early sixties, techno-artist Erkki Kurenniemi documenting his life through signal-recording technologies, resulting in audio cassette recordings, video diaries, photographs, 8mm films, digital videos

- "If we consider an archive as on the one hand a repository of data which through its categories and forms of classification offers a possibility of arriving at forms of knowledge and information, and on the other, as a utopian space where knowledge is 'free' (unrestricted and available) and can be 're-discovered' anew by making the archive an active practice, how are we to make sense of all the documentation gathered by Kurenniemi? What knowledges can result from following the active archive process and recording it?"; <http://www.constantvzw.org/site/Online-Archive-Erkki-Kurenniemi-In.html>

- archive contrary to "instant access" claim within a so-called *online archive*: temporally shelter data = "Sperrfrist"

- Constant started Active Archives project in 2006, experimenting with the activation of archives beyond preservation and access. In former times, files were enriched by external historiographical description for different connections, contexts and possible contradictions, but not changing the record from within. But once archival records are given away to creative

transformative algorithms and the file is received as transformed, it loses its archival integrity

- Constant members Michael Murtaugh and Nicolas Malevé running a series of experiments with a subset of the Kurenniemi's archive. *Online Archive: Erkki Kurenniemi (In 2048)* commissioned by Kurator and dOCUMENTA (13) in partnership with Central Art Archive of the Finnish National Gallery and Contemporary Art Museum KIASMA

- Morgens Jacobsen / Morten Søndergaard (eds), *Re-Action. The Digital Archive Experience*, xxx (Aalborg University Press) 2008

- <http://www.hf.uio.no/ifikk/english/research/projects/archive-in-motion/>

- [http://activearchives.org/wiki/Archive\\_in\\_motion-workshop](http://activearchives.org/wiki/Archive_in_motion-workshop)

- tools and algorithms to engage differently with structured and organic <= stochastically distributed?> sets of digital documents

- Kurenniemi relies on future computers to make sense of it all. By 2048, Erkki states that the technology will be ready for the advent of this new artificial form of intelligence. The quantum computer will sort by itself the documents he has been recording, capturing, filming, photographing, drawing, and talking about

- [http://activearchives.org/wiki/Manifesto\\_for\\_an\\_Active\\_Archive](http://activearchives.org/wiki/Manifesto_for_an_Active_Archive)

- exploring the multiplicity of orders contained within the archive: "While there is no clear organization in the different elements rescued from backup drives and workstations of Erkki, it doesn't mean no ordering was present. On the contrary, many orders coexist"; quantum-mechanical superposition

- "data laundry" (see Tumblr) *versus* ordered wardrobe; "learn to look at the images not according to their external description, their stories, but according to their internal composition (are they delicate? Are they chromatically compatible?) and we try to learn how to discover similarities between new sets treated by the same "program" (Constant)

- two kinds of "meta data": technical information (hardware / software, and automatic "semantic" content: MPEG7 standard), and implicit *information* contained (in latency) within the data files themselves; become "known" rather to algorithms than to human eyes

- "communication" with data files *via* algorithms on bit-level organization

- when legal protocols forbid the publication of the images until the people who are pictured have been contacted, the effect is not only hiding, but productive: creating different ways of representing the inherent qualities of the digitized "image", by-passing the immediate phenomenological appearance. The image knows more than what is protected by law (such as the privacy of humans in photography or video). "If the images cannot be 'shown', - and perhaps this is a blessing rather than a tragedy - what can be shown are the relationships

between them, as they can be narrated to us by agents to which we lend our reconfigured eyes. They can be sensed like a pulse, experienced as time capsules. Leaving aside the 'retinal' approach to the image, we are learning from probes and experiments how the computerized visual traces of Erkki's life let us feel temporal intensities, carnal distances and proximities. An image is an image. But an image is also many stories told to us by voluble algorithms and their nonhuman points of view."

- use different algorithms for face recognition, color analysis, contour detection and sense how they can gain knowledge of the content about the documents collection, the relationships that tie them together or separate them

- learn from computer to look at images (once digitized) not according to their external description (metadata, tags), their iconological stories, but according to their computer-graphical composition, chromatical compatibilities; "to learn how to discover similarities between new sets treated by the same "program"; Geoff Cox / Nicolas Malevé / Michael Murtaugh, Archiving the Data-body: human and nonhuman agency in the documents of Kurenniemi, in: Erkki Kurenniemi 2015 (MIT Press); [http://activearchives.org/wiki/Archiving\\_the\\_Data-body:\\_human\\_and\\_nonhuman\\_agency\\_in\\_the\\_documents\\_of\\_Kurenniemi](http://activearchives.org/wiki/Archiving_the_Data-body:_human_and_nonhuman_agency_in_the_documents_of_Kurenniemi)

- photographic analog images, once digitized, are arbitrarily "destroyed" as originals, to allow for different re-configurations (cp. Foucault's "series"); still different from Walter Benjamin's definition of the collector who "withdraws the object from its functional relations" for idiosyncratic assemblies. The *archival* quality of a record derives from its still functional relation to a (techno-)administrative system

- "Data Gallery" illustrates results from experimental algorithms. "The image is not what is shown on the page but what exists between knowledge produced by the different outputs. [...] The original image doesn't appear in the viewer's retina but it begins to exist in the imagination, and each image can be understood to contain its own archive"; <http://www.kurenniemi.constantvzw.org/db/records/images/view/2543>

- algorithmically navigate the digitized audio files according to their various mathematical properties like entropy; Fast Fourier Transform

- not "looking" at image but discover different, non-iconic qualities behind / within the hex file / dump core representation

- spectrum sort of audio files, atomizing the wave forms into tenth-of-a-second chunks with FFT; re-arrange according to criteria like speech-to-humming (singing), calmness / excitement, pitch / pauses; see program "Mr. Kov", Martin Carlé; DATA Radio

- thereby by-passing the copyright limitations; "forensic" inquiry replaces the original "image"

- producing "random" knowledge, more "forensic" (Kirschenbaum) than historico-hermeneutic. "The rise of forensics thereby gives an insight into how

inanimate objects have been ventriloquised, their testimonies voiced by human witnesses on behalf of the objects"

- Kurenniemi himself advertised for an "inhuman" way of operating with his life-log data, creating a "meta-archive for all human life", just keeping digital data for a future quantum computer to re-decipher

- Larsen, Lars Bang. Erkki Kurenniemi. Einführung. dOCUMENTA (13): 100 Notizen – 100 Gedanken, No. 007. Ostfildern: Hatje Cantz 2011; Mika Taanila, *The Future Is Not What It Used to Be* = documentary film, 52 min., Finland 2002; Cox, Geoff, Nicolas Malevé und Michael Murtaugh. "Archiving the Data-body: human and nonhuman agency in the documents of Kurenniemi." typecript version of article, now published in: Erkki Kurenniemi, 2015 MIT Press: [http://activearchives.org/wiki/Archiving\\_the\\_Data-body:\\_human\\_and\\_nonhuman\\_agency\\_in\\_the\\_documents\\_of\\_Kurenniemi](http://activearchives.org/wiki/Archiving_the_Data-body:_human_and_nonhuman_agency_in_the_documents_of_Kurenniemi)

- waiting for July 10, 2048, Erkki Kurenniemi's 107th anniversary and the date when his data body is expected to carry on after the biological body has inevitably failed

TRANSITORY "ARCHIVES". A Machine-Oriented Concept of Movement

### **Operative kinematographia**

- kinetic aspect widely neglected up until recently in archive terminology and practice. Most archives *of* movement are still subject to immobility. Temporary dynamics affect the archive itself if modelled in terms of the *turingmachine*, evoking the transitory archive

- David Gordon, *24 hours Psycho*: media-archaeologically undermining the story by slowing it down

- indispensable function of conventional archive activities is the documentation of administrative processes by preserving the accompanying textual sources over the long term. New options arise for genuinely media-based archives: in chrono-/photographic, then cinematographic and finally electronic form. The movement event (i.e. the kinematic indexicality) can be documented only when continuously embodied and implemented in operative media. Traditional archives rely extensively on a standard carrier medium format: paper and print (script). Inbetween is the storage of analog media like the gramophone record and magnetic tape, esp. for what is known as media art (sound, video). Later in the 20th century, however, the textual regime returns: within the computational media (source code, algorithms, "software" with its alpha-numeric code). "The issue of archiving that had been resolved in classical bibliography has re-emerged" = Recommendations for the Further Development of Communication and Media Sciences in German. Report of the Wissenschaftsrat [German Science and Humanities Council] from 25 May 2007; *online* <http://www.wissenschaftsrat.de/texte/7901-07.pdf>, p. 53. If we differentiate here between the surface (what is available to our eyes and ears

via interfaces) and its condition of possibility, then it means that the source codes (the Internet's own intrinsic "archive") also need to be archived.

- aesthetic of interim archives increasingly taking the former place of long-term archiving. Linked to this is another, dynamic cultural concept that is not primarily related to eternal saving but to a permanent transfer – a form of updating as data management. Theatre and dance are already transitory at the moment they are being performed. Dance is not only a physical form of movement art, but also kinetic knowledge and kinaesthesia. Dance archives as archives of movement require storage media that is capable of storing movement, and they are therefore, via the concrete dance form and beyond, of paradigmatic importance. It was the emergence of cinematography that made the no longer merely symbolic recording of movement possible, but at the same time its scientific analysis = Van Schaik, *Das kinetische Gedächtnis*, in: *Theaterschrift* 8 (1994)

- movement, previous to cinematographic media, could only be retained in symbolic terms; movement performed in real time has been as ephemeral and un-archivable as the voice. In early photography, with long-time exposure, living people in contrast to still objects such as architecture and sculpture, were only visible as pale shadows or strips. Phonography and cinematography changed all this abruptly. The 20th century generated dynamic archives and archives of the dynamic that related to one another transitively

- critical question in relation to this is the extent to which, in its tighter meaning, it should refer to an art form or a kinesis of bodies. Comparable with poetry in contrast to prose, dance means aesthetically arranged movement (*technè*). Media archaeology puts emphasis on the condition of possibility of dance in terms of the physical movement (*kínesis*), the distribution of energy, while dance theory concentrates mostly on the art form, i.e the cultural semantics of movement. To arithmetic research came the physical side, first through Descartes and Mersenne, than through Saveurs and later Helmholtz, underlines Marcel Stanislas Ducout in his blueprint for a veritable media dance, which sonified radio-electrically the movement of the dancer with the help of a device called "movline"<sup>74</sup>. This coupling of a dancing human and electronics is part of an epistemological form of dramatic art because it breaks with an occidental tradition, whereby the human body, when faced with technology, was always afforded a controlling role. In contrast to this was a cybernetically closed loop with the aptitude for feedback. In this way, the dancing body is carrying out an analysis of media.

- memory of motion requires storage media that is itself capable of movement, more allied to film archives than conventional file archives (Müller-Gellert, Hans-Joachim (1969): "Datenverarbeitung und Automation in einem Filmarchiv", in: *Der Archivar*, vol. 22 (1969), 395 – 402)

- (with)in time-based media, dynamic focus is on motion; instead of moving inbetween objects fixed in museum space, this corresponds with viewing moving images by manipulating a video tape on its time axis (non-linear jumps, speed forward/backward)

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74 See Marcel Stanislas Ducout (1940): *La danse sonore. Synthèse de la danse et de la musique*. Paris: Presses universitaires de France: 165 et seq



- project of the Institute for Academic Film in Göttingen, under the direction of the behavioural researcher Konrad Lorenz, has attempted to put the entire world of motion onto celluloid. Around 4,000 films were made, each of which recorded the motional process of a species. And this cinematographic archive of motions has a more expansive, epistemological notion of motion: "Not only animal species, of course, but also plant species or something from the field of technology, the mechanical strain on steel and so on."<sup>75</sup> Each film is, by itself, an archive of motions; even if (seemingly) nothing is moving in the picture, the celluloid is moving - and is therefore a movie. Manifestations of life are regular events in the passage of time, but these, paradoxically, are fixed in step-by-step frames in film. Mechanical-cinematic movements have been the test case for dance for a long time: With jerky, avant la lettre cinematographic movements, the robot Olympia in E. T. A. Hoffmann's novel *Der Sandmann* / [The Sandman] (1816) lowers her head and repeats the same gesture over and over again. Irritated, her human counterpart switches her off; the puppet freezes. The situation escalates in the ballet *Coppélia* (Arthur Saint-Léon, 1870), based on the book: "A dancer mimics a clockwork dancing doll simulating a dancer. The imitating movements, dancing twice removed, are predictably 'mechanical', given the discrepancies of outward resemblance between clockwork dancers and real ones." (Danto, Arthur E. (1980): "The use and mention of terms and the simulation of linguistic understanding". In: *The Behavioral and Brain Sciences* 1980, p. 428) Early cinematography (the camera-projector of the Lumière brothers is driven (synchronised) by the same mechanical clockwork as a spring mechanism, only that the function of this mechanism is not to show time but to record motion. "These discrepancies may diminish to zero with the technological progress of clockwork, until a dancer mimicking a clockwork dancer simulating a dancer may present a spectacle of three indiscernible dancers engaged in a pas de trois. By behavioral criteria, nothing would enable us to identify which is the doll, and the lingering question of whether the clockwork doll is really dancing or only seeming to seems merely verbal" (Danto 1980: 428).

- cinematographic media "archiving" in its most fundamental sense of *sampling* motion. More in the analytical-measuring sense than in the cinematographic-narrative sense, Etienne Jules Marey's and Eadweard Muybridge's series photography undertakes a discretisation of life that only becomes an antecedent of cinema in the retrospective perspectives of media history. Marey undertook motion studies, not as a way of fooling the eye, but exactly the opposite, to dismantle motion into individual images analytically. The media-archaeological view becomes the camera's privilege (Dziga Vertov), to look behind the optical illusion. In the era of technical perception, motion becomes a function of its discrete measurement. The techniques for storing motion open up the possibility that they be made available for extensive, additional uses for the specific, embodied and kinetic knowledge contained within them

- Henri Bergson's critique of measuring approach by which technological media grasp the essence of motion; chrono-photographic "analysis" of motion into

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<sup>75</sup> C. Carlson, documentarist at the Institute for Academic Film, Göttingen, Germany, interviewed by Christoph Keller, 1998, in: Christoph Keller, *Lost / Unfound: Archives As Objects As Monuments*, in the catalogue *ars viva 00/01 - Kunst und Wissenschaft*, Berlin 2000

smallest units of time = time exposure; closer to Bergsonian *durée*: Hiroshi Sugimoto's cinema photographs of an entire film with a single camera view, resulting in the white noise on the cinema screen; see Matthias Flügge et al. (eds.), *Raum. Orte der Kunst*, Nuremberg (Verlag für moderne Kunst) 2007, 304 ff.

- Karl Ernst von Baer defines as quasi-cinematic the awareness of changes in human cognition: "In one second, we have on average about six life moments, ten at the most."<sup>76</sup>

Long time exposure for works of dance theatre transforms the usual optic experience into a visually extended view that is only possible photographically and which, via the camera, superimposes the activity sequence from scene to scene and bundles it simultaneously into a sculpture of light. Photography does not freeze here the moment but, as a long time exposure, opens up temporal endurance (Bergson) itself. Drama itself is a time span. Theatre and dance as the oldest time-based arts enter into an alliance with the technological time-based media. The media-archaeological view of motion gets its chance to become part of the archiving of media if it (as Dziga Vertov put it) is no longer simply the human way of looking but the dispassionate view of the camera itself – *theoría* actually becomes media-active theory; Aljoscha Begrich / Jo Preußler, *Wie sich Theaterstücke einbilden. Für eine dramatische Fotografie des Theaters*, in: Hartmut Rosa (ed.), *fast forward. Essays zu Zeit und Beschleunigung*. Hamburg: edition Körber-Stiftung 2004, 145 – 157

- optical media that accelerates and condenses time give insights into the essence of motion that remain closed to human perception because their time window only memorises the immediate present (two to four seconds)

- In *Laokoon* (1766), Gotthold Ephraim Lessing decisively differentiated time-based art from space-based art. However, Loïe Fuller had time-frame photographs made of her dances. Does time mean the dynamic integration of motion and number? Chrono- and cinematography slices up motion and "counts" (not arithmetically but in terms of physical media) the motion as time in the sense of its Aristotelean definition of time itself as the effect of numerical measurement of movement. The "digitalisation" (as arithmetisation) of movement is always already implied when it comes to so-called time-based arts. If time is defined like this, the essential mathematicity of dance is implicit: *touto gar estin ho chronos, arithmos kineseos kata to proteron kai hysteron.*<sup>77</sup>

Camera choreographies merit special attention in dance archive collections. In video dance, dilatory time and time axis manipulation come into play as a genuine option for electronic-mathematic space in order to create movements that can develop in their time form exclusively in this medium and not on the real, body-focussed stage with its Aristotelean limitation of the drama to unity in space and time and action: compression and acceleration, fading in and fading out.<sup>78</sup>

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<sup>76</sup> Karl Ernst von Baer, *Schriften*. Stuttgart 1907: 141

<sup>77</sup> Aristoteles, *Physics*, book IV (219b 1-2)

- performative, body-centered (even if media-augmented) theatre (Fischer-Lichte) *versus* operative media theatre (from within the signal processing)

- time manipulation as superposition (overlay of temporality, or on the time-critical level: supra-position, "underlay") started essentially with technological recording media. The medium of analysis here becomes a dramaturgical medium itself.

### **Dance of the electrons / mathematics in motion**

- cinematics formulated systematically at the end of the 19th century by Franz Reuleaux, *Theoretische Kinematik. Grundzüge einer Theorie des Maschinenwesens*, Brunswick (Vieweg) 1875

- early electrotechnology exclusively "Mechanismus, nach dem sich die Elektronen zu gemeinsamem Tanze ordnen" ["the mechanism according to which the electrons 'arrange themselves in a common dance'"] (Möller, H. G. (1930): "Über die Frequenz der Barkhausenschwingungen". In: *Elektrische Nachrichten-Technik (E.N.T.)* 1930, issue 11, pp. 411 - 419: 411); electron tube used *within* computers as intermediary storage device is in fact a choreography of symbolically coded electrons. This algorithmic dance on the screen of the image storing tube was hardly visible to the programming engineer: "Meaning can only be given to the 'mad dance' of the picture dots on the Mark I." (Link, David (2006): "There Must Be an Angel. On the Beginnings of the Arithmetics of Rays". In: Siegfried Zielinski und David Link (Ed.), *Variantology 2. On Deep Time Relations of Arts, Sciences and Technologies*. Cologne: Walther König, pp. 15 - 42: 42)

- Rudolf von Laban liberates dance from its overdetermined poetic form; he considered dance as a combination of impetus and motion, i.e. more in terms of physics. For the archiving of all forms of movement, the notation he developed understood itself to be, in the wider sense, suitable notation in symbols (Laban, Rudolf von: *Choreutik. Grundlagen der Raum-Harmonielehre des Tanzes*. Wilhelmshaven 1991: Noetzel). Laban coined the concept of kinesphere. Today, movement recording media are available beyond the written-graphic notation: electronic (analogue video) or digital; graphic indexing of working motion was developed along the lines of symbolic dance notation; the Fordism of factory work generated its own motion analysis (Pias, Claus (2002): *Computer - Spiel - Welten*. Vienna: Sonderzahl); in the early period of the Soviet Union Gastev's "Time League"<sup>79</sup>. It is only one more step from the graphic methods of 19th century physiology to video dance. And in taking it we move closer to the oscillograph screen, in the centre of which the electronic beam dances. The electronic image on the other hand is not only made up only of 24 small photographs per second, like film, but each individual

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78 An example of video dance: *Topic I & II*, France 1990, director: Pascal Baes, choreography: Sara Denizot

79 On Gastev's enterprise see Siegfried Zielinski, *Archäologie der Medien. Zur Tiefenzeit des technischen Hörens und Sehens*, Reinbek b. Hamburg (Rowohlt) 2002

image is made up of time, in terms of television then more than 600 lines per second that are recorded by a pixel that never stops running.

- cinematographic media still chrono-photographically "still" dance motion; electronic in a position to record real body movement. Only moving media can record movements in their vibrancy; in contrast to cinematography, which is discrete and mechanical, electromagnetic recording (on video) is a differential, a dynamic bridging of sequences of movement. At the beginning of the 20th century, the Italian Futurist Antonio Giulio Bragaglia founded the antithesis to early cinematography. In contrast to the analytical, discretionary aesthetics of chronophotography, "fotodinamismo futurista" located the photographic compression of a movement, that is to say its collective singular, on the frontier of frequency analysis and the aesthetics of the electromagnetic field, so that he staged material, space and time as, concurrently, a homogenous and differential arrangement, as a fundamental ephemeral, as a passage, as a traject = Walburga Hülk / Marijana Erstic, "Vom Erscheinen und Verschwinden der Gegenstände, in: Ralph Schnell / Georg Stanitzek (eds.), Ephemeres. Mediale Innovationen 1900/2000, Bielefeld (transcript) 2005, 43-61 (52 ff.)

### **Time to think the differential archive**

- "archives of motion", on the basis of the media process, share an indexical relationship with time, technically integrating memory according to time

- time-critical element of motion can be understood mathematically (in terms of  $\Delta t \rightarrow 0$ ). Mathematics puts us (through analysis) in a position to master time processes analytically (via deduction according to time). Mathematics itself, however, cannot implement time.

- from the mathematical analysis of movement to its (re-)synthesis in a mathematised machine, the computer. While cinematography is just able to record and reproduce movement, operational mathematics can create motion from nothing

- when calculated, algorithmic objects become subject to archival preservation, the conventional archive implodes

- algorithmic culture, not simply continuous analog motion sampled by recording (cinematography, digitization), but motion itself non-linear: "Diff is a Unix command that shows the differences between files. Git is similarly based on a file structure that works on the basis of marking the differences between objects stored in the repository. A diff is based simply on a character-by-character analysis of a file. Every change is logged and is retrievable by choosing the right commit. [...] Archives tend to work with exemplars, not variations. With Git, as with all forms of computer memory that always involve making copies of files, objects no longer need to exist uniquely; indeed, they cannot do so if they are to be used within the system. The archive in this case comes into being as a process of structural differentiation rather than as a thing. Overall, Git is a massive graph structure and each code object, each archived file is a set of trajectories across this graph" = Matthew Fuller, Andrew Goffey, Adrian Mackenzie, Richard Mills, and Stuart Sharples, Big Diff,

Granularity, Incoherence, and Production in the Github Software Repository, in: *Memory in Motion. Archives, Technology, and the Social*, ed. by Ina Blom, Trond Lundemo, and Eivind Røssaak, Amsterdam (AUP) 2017, 87-102 (97)

- "hashes of symbols and diffs, the archive transitions into a systematization of the archive as an engine of minutely and massively assembled processes of addition and variation. Rather than the archive storing history as a set of exemplary if not necessarily unique entities, history is involuted in the archive rather than stored in it" = Fuller et al. 2017: 98

### **Archives of motion *versus* archives in motion**

- "archiving" web pages (like in archive.org) achieved through freezing the page in time, and thus loses the dynamic quality of its updates, reconstructions, etc.; therefore the Wayback Machine allows for stepping backwards on the timeline

- distinguish between the archive *of* motion (films and sound recordings) and an archive as a concept *in* motion

- mechanic operation technologically asymmetric compared with human "performance". Taking "dance" in a more general sense as artful movements, such kinetic phenomena are subjects of archivization on the one hand (archives of dance); at the same time, a dynamization of "the archive" itself takes place with time-based and data-processing media (the algorithmization / rhythmicity of the digital archive). So let us distinguish between the archive *of* motion, the storage of films and sound recordings, which requires that the archive is immobile in itself, and an archive as a concept *in* motion. This requires to differentiate between "memory", "storage" and "archive", between "analog" and "digital" recording of movement, between performative "re-enactment" and archival history.

- rhythms = performative time-measure; clocking = operative time base

- from motion domain to time domain: An archaeological reconstructive indication of tempo, e. g., "can be drawn from the relation of music to movement. We do not know how to match notes to dance-steps"<sup>80</sup>, but from the way a tragic or comic chorus enters the stage in a classic Greek drama, we can derive "a fair idea of the tempo. "When they are not / running but walking at a good speed, Aristophanes makes the rhythm iambic" <ibid., 154 f.>.

- essential operation to create an archive of moving arts 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 chronophotography), thus literally embodying / engraving ("groove") - in respect to Aristotle's correlation of time-number-movement - the over-countable ("überabzählbare") event.

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80 M. L. West, *Ancient Greek Music*, Oxford (Clarendon Press) 1994, 154

- re-enactment of historic media art raises crucial question: Does this require the original technological hardware (video electronics, f. e.), or functionally equivalent devices?
- time, in Aristotle's book on *Physics*, is defined by numerical measurement of movements; essential mathematicity of motion analysis is implicit
- technological *a priori*, in the case of dance, leads from passive recording to active *techno-poiesis*: "Operative" 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 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 = argument in the lecture "Screen-Dance/From Stage to Film and Back" by Claudia Kappenberg (Brighton) at the International Symposium ARCHIVE/PRACTICE in Leipzig and Dresden-Hellerau, December 10th-13th, 2009
- cumulative memory one thing; adaptive (algorithmic / algorithmic) storage another<sup>81</sup>
- media archaeology concerned with media not only on their structural but as well on their *operative* level, thus becoming "diagrammatic". The time-critical, post-structural vector of media archaeology as diagrammatic media theory places it close to signal analysis, with a signal being the physical representation of a message respectively information. Any media event thus is "Zeitfunktionen der Signale"<sup>82</sup>
- essence of digital data processing: storage becomes less enduring ("archival") and more intermediary (ephemeral)
- in stored-program computing, principal storage is kind of inter-archive, a short-time memory which later, by Howard Aiken for his Harvard Mark I, has been called "register", whereas for enduring data storage magnetic tapes and punched cards figured. "Numbers may be removed from the calculating unit and temporarily stored in storage position"<sup>83</sup>

### **Media archaeology: Technology as "archivist" of moving memory (Phonovision)**

- in media memory culture, intermediary storage dynamics (the RAM) replaces „archival space“ (Michel de Certeau)
- earliest known recording from a Television Transmission is the revue *Looking In*, performed by the Paramount Astoria Girls on the BBC Baird television

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81 See Heinz von Foerster, Gedächtnis ohne Aufzeichnung, in: same author, Sicht und Einsicht, xxx, 1985, 133- (135)

82 Karl Küpfmüller, Die Systemtheorie der elektrischen Nachrichtenübertragung, Stuttgart (Hirzel) 1974, 393

83 Howard Aiken, Proposed Automatic Calculating Machine (1938), as quoted in Coy 2007: 81

system (30 lines) in April 1933, recorded by an enthusiastic amateur on his recording equipment (the Baird Phonovision system) on aluminium disc. 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 Paramount 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" = McLean 200: 211 f.

- Restored Video Recordings 1927-1935; esp. ballett sequence, from Baird's *Phonovision* = <http://www.tvdawn.com/recordng.htm>

## "Really" archiving movement

- 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

Different from symbolical dance notation which results in always individual regenerations of actual movement sequences, audiovisual recording is able to register artistic expression like music and dance in high temporal fidelity to the unique event, thus suspending it from history in favor of re-presentation. When we watch a video from the archive, even though we cognitively know about the historicity of the performance, our senses cannot but treat it like a present event; liveness by kinetics which no graphical notation can ever approximate<sup>84</sup>

- countable movement, which sounds like an oxymoron, can be analyzed only by use of real numbers which can not fully be caught by symbolical notation but only take place in corresponding signal-based media. Only analog media like the phonograph allow for an archiving 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.<sup>85</sup> Once dance is not only graphically, but technographically recorded, its dynamic re-play challenges the classificatory order of the archive itself, to be replaced by probabilities which is the field of mathematical stochastics. William J. Mitchell writes in *The Reconfigured Eye*: "We must abandon the traditional conception of an art world populated by stable, enduring, finished works and replace it with one that recognizes

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<sup>84</sup> Dietrich Schüller, Von der Bewahrung des Trägers zur Bewahrung des Inhalts, in: *Medium* Nr. 4 (1994), thematic issue: *Archive - Medien als Gedächtnis*, 28-32 (28)

<sup>85</sup> See Friedrich Kittler, *Die Welt des Symbolischen - eine Welt der Maschine*, in: same author, *Draculas Vermächtnis. Technische Schriften*, Leipzig (Reclam) 1991, 58-80 (68)

continual mutation and proliferation of variants - much as with oral poetry."<sup>86</sup>

- from complete mathematical (literal) *analysis* of recordings of artful movement (in terms of real numbers) results a *dynarchive* which is reconfigurable in order to reveal new analytic insights without destroying the recorded event itself. Cumulative memory is one thing; adaptive (algorithmic) storage another.<sup>87</sup>

### **Re-enactment and the archive**

- 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*)<sup>88</sup>

- In Samuel Beckett's once-act play *Krapp's Last Tape*, the act of reading in the tape inventory ("ledger") leads to cognitive time calculation, while the acoustic channel performs physiological signal processing

- technical repeatability leading to almost a-historical functional re-enactment; the experience of high-tech media time is closer to the 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 is between an active 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 - equiprimordial (*gleichursprüngliches*) reenactment

### **Archive, diagram and movement**

- cinematographical motion study not reduced to the iconology of the single image but emerges in a relational web which diagrammatically unfolds.<sup>89</sup> Any archive of temporal figures is marked by such vectors

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86 William J. Mitchell, *The Reconfigured Eye. Visual Truth in the Post-Photographic Era*, MIT Press, 1992, 52

87 See Heinz von Foerster, *Gedächtnis ohne Aufzeichnung*, in: same author, *Sicht und Einsicht. Versuche zu einer operativen Erkenntnistheorie*, Braunschweig / Wiesbaden (Vieweg) 1985, 135

88 See Henri Bergson, *Perception du changement*, Oxford 1911, and same author, *Données immédiates de la conscience*, Paris 1889

89 See André Wendler / Lorenz Engell, *Medienwissenschaft der Motive*, in: *Zeitschrift für Medienwissenschaft* 1/2009, 38-49 (42)



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*.

## **From spatial to time-based archives**

- the non-archivable, like Fluxus art in its self-estimation once claimed (though it later became subject of documentation); electronic technology of the new archive privileges the ephemeral. The authoritative stability of the archive liquifies in the age of electronic communication; even the signature becomes digital; Jacques Derrida, *Archive Fever*, xxx. Electronic memory is transitory and thus comes closer to the dynamic essence of dance itself.; The electronic archive transforms from a stable data storage to a dynamic, self-organisational system of fluid data.<sup>90</sup> The principal storage in computers is a kind of temporary archive, a short-time memory which has been called "register"; essence of digital data processing that memories become increasingly intermediary

DATA, UNDEAD, or: THIS IS NOT AN ARCHIVE

## **Concept for a *generative* archive**

- traditional archive has been a *read only memory*, not to be re- or overwritten while reading (a concept still maintained by the CD-ROM). In multi-media space, however, the act of reading, that is: the act of re-activating the record, can be dynamically coupled with feedback.

- hidden archive = compression algorithm of digital video streams in order to make them storable and transmittable at all. While in the transmission of archived text in the occidental tradition every letter counts - which is critical for philology -, by compressing and decompressing digital records, subtle amounts of data are lost. This ratio is measured against the bandwidth of human senses (like film frame frequency in regards to visual motion detection). The aesthetic illusion of multi-media, then, is for human eyes only

- average record of the archive is still textual; re-think archival terminology towards a signal-based (analog) and processual (algorithmic) media-archival concept

- archive traditionally has institutionally, even legally, sealed off its records from present access; online use of digital records is "checking it out, constantly

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90 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)

evaluating"<sup>91</sup>. Thus media memory is de-monumentalized, just as Erasmus detected in putting together his *Adages*: "I could add things even during the printing, if anything came to hand which should not be left out" - mobile letters, as quoted by Sawday in Sawday / Rhodes (eds.) 2000: xxx>

- sum of objects in Legrady's installation is organized through a self-organizing map algorithm" (from medialab Helsinki: Kohonen algorithm); the sorting of items is no longer subject to verbal indexing, to keywords provided by the user-archivist since the objects scanned are organized by the sorting algorithm "according to descriptions provided by the object contributors." The SOM simulates associative memory. Kohonen Self-organizing map (SOM) algorithm from neural net studies offers a wider range of genuine mediatic options: "to explore organizational methods based on properties such as material, age, etc. and associative meanings such as cultural and personal value by which to map put the relative position between things in a collection" <handout>; cp. Vannevar Bush's design of a *Memex*

- an active media archaeology, George Legrady's installation *A pocket full of memories*, dis-covers the hidden archive behind the apparent collection: "Data structures by which digitized information come to us are normally hidden from view but my position is that the design of these structures is the key site of aesthetic practice where the author's (or a culture's ) point of view <...> are encoded and expressed" <handout> - literally encoded, that is: programmed. His installation show (unwillingly?), that behind every "story" there is a naked technological structure, an archival skeleton, actually hidden from the discursive user interface.

- HTML as a protocol more than just texts. Nelson comments of Vannevar Bush's 1945 design of an associative, micro-film based memory machine, the famous *Memory Extender (MEMEX)*: "Bush rejected indexing and discussed instead new forms of interwoven documents."<sup>92</sup>

- David Gelernter points at data flow called *lifestream* as a future alternative to the current desktop-metaphor of present 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. Emphatic memory (on hard-disks) in Gelernter's scenario is being replaced by a future of the computer as a place of intermediary, passing storage: „The Lifestreams system treats your own private computer as a mere temporary holding tank for data, not as a permanent file cabinet"; "Our candidate for replacing the desktop is called 'Lifestreams'." David Gelernter, *Machine Beauty. Elegance and the Heart of Technology*, New York (Basic Books) 1997, 106. Future, present and past

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91 Mark U. Edwards, Jr., *Printing, Propaganda, and Martin Luther*, Berkeley / Los Angeles / London (University of California Press) 1994, 163; Neil Rhodes / Jonathan Sawday (eds.), *The Renaissance computer: knowledge technology in the first age of print*, London / New York (Routledge) 2000, 12

92 Theodor H. Nelson, „As We Will Think“, in: James M. Nyce / Paul Kahn (eds.), *From Memex to Hypertext: Vannevar Bush and the Mind's Machine*, San Diego / London (Academic Press) 1991, 259 (245 u. 253)

are but segments, functions of marking differences within the data stream; by calling it "life stream", Gelernter once more falls victim to the prosopopietics rhetoric of the archival discourse. Mistaking the archive for stored life. How to look at the archive in a non-prosopopietic way?

## **Computer games and narrative**

- new media "literacy" is about bits, which the *turingmachine* reads and (re-)writes
- Jesper Juul, Games telling Stories? in: Games Studies (2001), 7: Games are not narrative, but configurative; cp. TM "m-configurations" = Turing 1936
- games are double-rendered, on the time-axis (play) and on the spatial axis (programming)
- computer games time-critical, with short-term moves and short-term neurological memory. The message of the medium computer games is not stories, but: cybernetics. Man experiences himself as a cybernetical model when interacting with digital media. In computer games a new concept of time is introduced
- aesthetics of CD-ROM: Programmer not interested in story; jump addresses (to Hot Spots). Designing a Computer Game = 95 % administration (links); 5 % authorship; algorithm replaces story-board
- un/balance between storytelling (plot) and interactivity
- *Myst*: When players enters the scene, no narrative guide; "story" unfolds only in experimentation; Aaseh, "ergodic" literature
- narrative structures in computer games a function of accelerating hardware, software, graphical resolution, memory capacities

## **INTERRUPTING THE "ANARCHIVAL" DISCOURSE**

- archive as memory metaphor in cultural discourse has literally got *in motion* = Rossaak, ed., indicated by terms like the "processual archive", but it would be media-politically naive to confuse the phenomenological appeal of the *dynarchive* with its underlying techno-mathematical infra- and substructures (algorithms, DRAM) which are more strictly 'archival' than ever in their media-archaeological realities

## **From the archive to the anarchival impulse and back again**

- current hypertextual World Wide Web with its underlying techno-mathematical substructures of algorithms embedded in the storage-programmable computer and its literally *dynamic* Random Access Memory (DRAM) are more strictly

"archival" than ever in its media-archaeological realities. Maybe the digital media art archive tends to the an-archival memory aesthetics = Bruno

Lessard: The ANARCHIVE Project. In: Convergence. The International Journal of Research into New Media Technologies 15 (2009) no. 3, 315-331; digital media archive does *not*

- most rigid archival order is still the basis for digital memory and communication technologies

Inbetween the archival and the anarchival, the dynarchive has emerged. Digital data need constant up-dating (in terms of software) and "migration" (in terms of hardware to embody them). From that derives a change from the ideal of archival eternity to permanent change. Both the archive in its media base *and* the archive as discourse have literally got *in motion*, as is indicated by terms like the "processual" archive; Eivind Røssaak (ed.), *The Archive in Motion. New Conceptions of the Archive in Contemporary Thought and New Media Practices*, Oslo (Novus) 2010. By definition, the "storage-programmable" von-Neumann-architecture of current digital computers interlaces real-time processing and intermediary storage of data. Micro-archiving the present has become the signature of digital culture in times of online communication media.

Conceptually, the dynamic archive is relational not only in a structural or spatial but as well in a temporal sense. But how can the concept of 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? In classic taxonomy (especially in the Prussian state tradition), the primary task of the archivist is to keep the configuration of incoming record groups intact. This clashes with the data bank aesthetics of the digital age which is characterized by the mutability not only of the archival records themselves but of its archival infrastructure (both hardware and software) as well. Thereby the traditionally enduring time base of the archive itself is replaced restless reconfiguration.

- archival endurance (oscillating between historical and entropical time) undermined when a record is not fixed any more on a permanent material storage medium like parchment but takes places electronically; flow (the current) replaces the static inscription

- Foucault's *Archéologie du Savoir* (1969) once translated the Kantian *a priori* of sensation (space and time) into his definition of *l'archive* as the laws of what can be expressed and administrated at all.<sup>93</sup> "The archive is first the law of what can be said, the system that governs the appearance of statements as unique events"<sup>94</sup>, whereas archaeology "questions the already-said at the level of its existence and the general archive system to which it belongs." Foucault's term archaeology explicitly "does not imply the search for a beginning; it does

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93 Michel Foucault, *Archaeology of Knowledge*, transl. A. M. Sheridan Smith, New York (Random House) 1972, 128 ff.

94 Michel Foucault, *The Archaeology of Knowledge*, transl. A. M. Sheridan Smith [1972], London / New York (Routledge Classics) 2002, 145

not relate analysis to a geological excavation" = Michel Foucault 1972 / 2002: 148

- "It is also possible, however, to understand technological a priori in a technological sense."<sup>95</sup> Media archaeology understands the archive and the "archival drive" (Mackenzie) in its Kantian and Foucauldian sense: as the *a priori* of the techno-logical event, the condition of possibility for electronic signals and data to circulate and be retrieved at all, "generated by the referencing and storage structures of the networks themselves"<sup>96</sup> = the *generative* archive. Instead of the traditional idea that there are objects taken out of current circulation to be preserved in an electronic archive, there are truly virtual, i. e.: algorithmically generated "records"

### **The transient archive: From permanent memory to intermediary storage**

- "past" is what has been recorded for (and into) storage, while the present is all about uncertainty about future states - an anarchival condition

- cultural parameters like "historical tradition" or "cultural heritage" under attack, to be replaced by immediate archiving of the present in real-time on the one hand, and re-presenting the archive at an instant, as practiced in Web platforms like Facebook and necessitated by photography services like Instagram.<sup>97</sup> Presence is shifted to an always already archived present; tangible reality is digitally absorbed immediately.

- generalizing term "memory" more sharply replaced by "storage" when it comes to address time-shifted signals and data. German "Speicher" (store) derives from Latin *speculum* which is the granary in its material presence. This "memory" consists of a rather stochastic distribution of its single atomic elements, as opposed to the symbolic order of e. g. alphabet words in a textual record. Granularity has been discovered in recent Digital Signal Processing to emulate the physicality of e. g. musical instruments (instead of their just functional simulation)

- museum, library and archive fulfilled the function of storage of cultural memory "capital" so far; but digital storage media are rather governed by dynamic Random Access Memory, based on repetitive refresh cycles; appears anarchival, but the opposite is the memory-administrative truth. Each memory cell is being addressed by the most precise coordinates of numerical codes

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95 Friedrich A. Kittler, *Gramophone - Film - Typewriter* (transl. Geoffrey Winthrop-Young / Michael Wutz, Stanford, Cal. (Stanford UP) 1999: 117

96 Adrian Mackenzie, *The Mortality of the Virtual. Real-time, Archive and Dead-time in Information Network*, in: *Convergence* vol. 3, no. 2 (1997), 59-71 (61)

97 See *Instant-Glück mit Instagram. Die Rückkehr der Aura in der Handy-Fotografie*, in: *Neue Bücher Zeitung*, June 10, 2013: [www.nzz.ch/aktuell/feuilleton/uebersicht/instant-glueck-mit-instagram-1.18096066](http://www.nzz.ch/aktuell/feuilleton/uebersicht/instant-glueck-mit-instagram-1.18096066) (accessed May 15, 2014)

- "When engineers refer to a computer's `memory` they really don't mean an emphatic memory but refer to "recording electric signals which when needed for further manipulations can be layed back again. [...] `memory` is a misleading metaphor for recording devices [...]."98
- cultural value shifting from its material embodiment in objects like printed texts, paintings or architecture towards a dynamics which itself is a function of algorithmically processed, storage-programmable computing
- recycling replaces teleological finality: The traditional line of production - accumulation - consumption - devaluation - waste or rubbish is condensed into closed circuits; catalogue „Ex und hopp. Das Prinzip Wegwerf. Eine Bilanz mit Verlusten“ on the principle of throw-away, ed. Ot Hoffmann (for Deutscher Werkbund) 1989; Michael Thompson, Rubbish Theory. The creation and destruction of value, Oxford UP 1979
- inner life of computing and communication engineering itself: a delicate system of "sampling" audio-visual signals in high frequencies and its mathematical processing which consists of ultra-short moments of intermediary storage (the "registers" in the Central Processing Unit, a term borrowed from archival science) and volatile short-time storage chips for intermediary calculation, facilitating compression algorithms for massive data transfer in digital tele-communication
- oscillating between short-time memory and instant erasure, archival value in its web-based existence not linked to archival institutions any more but literally *online* coupled to permanent feedback in present negotiation. In this process, "*negative feedback* influences the sender to correct or change the message because of observed undesired effects
- communicative homeostasis, the maintenance of a steady state" - different from *positive feedback* which reinforces existing structures99
- inbetween the imaginary of cultural time ("history" as a function historiographical narrative) and the real (the "event"): the symbolic regime with its archive-texture and tectonics
- algorithmic record processing down to its atomic bits (instead of simple file "management") disrupting alliance that the traditional paper-based governmental archives have maintained with historicism since eighteenth century. "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."100

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98 Heinz von Förster, Thoughts and Notes on Cognition, in: Paul L. Garvin (ed.), Cognition: A Multiple View, New York / Washington (Spartan Books) 1970, 25-48 (29f)

99 See Winfried Nöth, Handbook of Semiotics, Stuttgart 1990, 178

100 Kittler 1996: 75

- algorithms provide memory with a new kind of "combinatory power" = Kittler 1996: 74; not static but dynamic. Many virtual collections enables the user to work within the digital metaphor of the archive; the institutional freezing of archival classification is counter-balanced by flexible and direct access to data storage, thereby allowing to sort data objects into different groups. Such software offers the user an active role, closer to the *generative* than the preserving archive

## ARCHIVAL VALUE AND ENTROPY

### **Memory / Information / Entropy**

- traditional state archive a function of well-regulated rules of transformation passing records from administration into permanent residence according to provenance; symbolic order radically differs from the ratio in communication engineering where information is measured as entropy value, derived from stochastic transition probabilities which have been statistically pre-calculated. The concept of entropy as the second law of thermodynamics has found its way into data transmission; here, informational entropy is the degree of uncertainty of a given string of discrete signals.

- once analog material has been digitized, tension between storage and dissemination at the base of such an archive is resolved by the option of immediate online-accessability of data files

If culture is defined by its capacities to transform the inclination towards oblivion into memory (according to Jurij M. Lotman and B. A. Uspenskij<sup>101</sup>), then the growing predominance of intermediary storage contributes to a radical transformation of the cultural economy. The ideal of accumulation is part of the humanist legacy: To renaissance readers, the letter of the text was latent energy waiting to be activated by the act of reading as interpretation. "Libraries are capital which contribute countless interest silently", Goethe expressed after visiting the university library at Göttingen 1878. This language is being replaced by - alluding the *new historicist* vocabulary - circulation, by recycling „mnemonic energies“ (Aby Warburg). The electronic *media* create (technically falsely) the illusion of an im-mediate access to the past.

- dead memory capital. Order U I No. 43 of 9th January 1905 issued by Fr. Althoff in the Prussian Ministry of Education to the General Director of the Royal Library in Berlin and to the directors of Prussian university libraries asked for the storage of „dead books“ to be separated from the current libraries or even to destroy such books out of use.<sup>102</sup>

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101 Jurij M. Lotman und B. A. Uspenskij, "Zum semiotischen Mechanismus der Kultur", in: *Semiotica Sovietica* 2, ed. K. Eimermacher, Aachen 1986, 853-880: 859

102 See Hartwig Lohse, „Tote und `scheintote´ Literatur“, in: Gert Kaiser (ed.), *Bücher für die Wissenschaft. Bibliotheken zwischen Tradition und Fortschritt*, Munich et al. (K. G. Saur) 1994, 143-158

- economy minimizing the temporal length of storage (which then is „dead capital“); the electronic supply system of the Benetton company virtually programs its storage time to zero by a supply-demand-relationship aiming at real-time. Electronic random access to the stores turn memory into the omnipresence of commodities

- electronic age arrives at erasing the opposition between monumental inscription and discursive flow. Precision and fast variability are next to each other; digital codes are able to register and to undo those registers in virtual real-time.<sup>103</sup> The analysis of the radical restructuring of our relationship with the past has to be as fast as its object; in order to achieve that, negotiation with what is perceived as past has to be freed from the supremacy of historical discourse which has controlled such negotiation for the last two hundred years. What is needed under post-modern conditions is free accessibility of storage spaces (J.-F. Lyotard)

- computer not interested in the analytical laws of identity and difference but rather in algorithms to master data, re-calling what is known in writing as quotes. Thinking will be computing: combining, devaluating the semiotic status of representation; stable relation between sign and reference will be undone in favor of juxtaposing signs - which has been the spatial principle of museums, archives and libraries already. Argumentation is being replaced by notation.<sup>104</sup> Against the euphoria of hypertextual navigation through data landscapes and the liberation of the text from its restrictions in the print era, against the impression of the seeming arbitrariness and endless shifting of signifiers, attention to the kind of barriers which arrest such flow in a non-arbitrary way, such as pass words. Engineering of memory involves hierarchical modularisation; each modul strives at hiding as much information about its own processing as possible - *information hiding*<sup>105</sup>

- digitalisation of texts, images and sound de-couples them from their denotative reference in real archives; *memory* is being transformed cybernetically into synchronic information networks. This decontextualisation has been put forward by analogue techniques of reproduction (xerox copy f. e.) already

- hypertextual expansion replaces storage; the placement of items is being defined by its relations, formally to be described in terms of arrays, trees and grids. The ordering of coded elements, its distribution in structures or at random become a function of memory capacities. Demography makes this

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103 See Aleida Assmann, Fest und flüssig: Anmerkungen zu einer Denkfigur, in: same author / Harth (eds.), Kultur, 181-198, note 18

104 Martin Groß, Ein neuer Buchtyp: das bibliographische Bulletin, in: Ästhetik & Kommunikation 67/68, vol. 18 (1987), 5 f.

105 Entry "Software-Engineering", in: *Schüler Duden: Die Informatik*, ed. Meyers Lexikonredaktion, scientific editing by Volker Claus and Andreas Schwill, 2nd edition Mannheim et al. (Dudenverlag) 1991, 473



challenge transparent: We have arrived at an époque where space represents itself in terms of storage relations.<sup>106</sup>

- Internet turned the notion of the archive into a metaphor for *data retrieval*: "The Internet has had plenty of time to evolve. <...> 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

- (magnetic) *Core war*: computer program viruses search for memory to be destroyed. *Office 95* by *Microsoft* manages to deal with mixed documents (schedules and texts, dealt with in the mixed genres of Word processing and calculation by Excel. Word though fills the empty spaces, being kept for schedules, with *lieu-tenants* - usually empty spaces of zero numbers. *Office 95* though fills those voids with data from effaced files - memory of electronic waste; rubbish data may become visible when edited with special programs; sent as a-mail attachments through the internet they can be deciphered in public<sup>107</sup>

In order to resist filling these gaps, something like „empty signifiers“ are required. But how the represent a void without turning it immediately, and by the very process of signification, into a presentation, i. e. a mark of presence? Mathematically, the cipher (which means literally) *zero* is to fulfill this function; on my keyboard, it is the key for *blanc* which performs this (which, in digital terms, is nothing but a - positive - bit as well, indifferent to other ciphers or letters or ASCII signs). Maybe the only way out is to quit the semiotic realm, not talking about signs any more, but reconsidering signs as signals, i. e. as very physical impulses - the very flow and energy of internet (as) information.

"The receiver's reaction can actually be observed (and thus cause corrections with the sender) or it can be anticipated. For the latter case of influence on the signal production by the sender's assumptions about potential effects the term *feedforward* has also been suggested."<sup>108</sup>

- state of affairs can be described as Markov process: that is, a specific stochastic probability calculation which requires for the calculation of future developments of continual time(*t*)-dependend accidental values just the knowledge of the present state. The aim is no more creating monuments for future memories but providing documents for case studies in *real time* analysis<sup>109</sup>

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106 Foucault *ibid.*, 36 f.

107 „Nach uns der Müll“, in: *Die Zeit* of 20th October 1995

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

109 Foucault *op. cit.*, 246f

- feedback control of linear & nonlinear systems<sup>110</sup>; evolution as algorithmic or stochastic process. By the example of population models of the Verhulst-dynamics can be demonstrated that a non-linear relation  $f(x_n)$  with square maximum can lead to leaps and even to chaotic behaviour - deterministic chaos. This requires the application of the feedback algorithm<sup>111</sup>, reminding of Mendel's nineteenth century re-crossing of plants in search of genetic laws, proving the discreteness of genes and their free combination

### **(Neg-)Entropy and dis/order in times of binary information processing**

- redefine *archival value* in terms of information theory, towards an entropic definition of the informational archive. Entropy as statistical parameter which measures how much information is produced on the average for each letter of a text can be extended to every object which is symbolically coded in alphanumeric strings - *vulgo* "digital communication". Whereas statistics is still an "archival" (list-based) approach, stochastics (deciphered as Markov chains) shifts the past / present correlation towards predictive analytics

- economic concept of "chaotic store administration" corresponds with "hashing" approach<sup>112</sup>

- dis-cover the informational value from *within* the objects stored in an archive or museum, such as the histograms in digital image processing, calculating the aesthetic entropy of an image; therefore re-define archival value" in terms of information theory

- current fascination with the "anarchival" as discursive category corresponds with a functional criterium of techno-mathematical communication theory: the signal-to-noise ratio. Twentieth century communication engineering has resulted in a positive connotation of what culturally had been rejected for centuries: noise. In addition, disorder (from the point of view of second order cybernetics) has become a situation not to be afraid of any more.

Mathematical statistics and stochastics has been developed in the nineteenth century to copy with death rates in live assurance policies (on the level of social administration) and with the laws of thermodynamics in energy management. According to the Second Law of Thermodynamics each system tends, when mapped upon the temporal axis, to increasing dis-order. Ludwig Boltzmann's calculus of entropy (the tendency from order to disorder as a physical manifestation of the arrow of time) has been used as a model for measuring the degree of probabilities in digital information theory.

In 1962, Marshall McLuhan published his analysis of "the making of typographic man".<sup>113</sup> Digital culture can be defined as a secondary *Gutenberg*

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<sup>110</sup> Book title by D. Hinrichsen and A. Isidori, Berlin (Springer) 1982

<sup>111</sup> Seifritz, op. cit., 41

<sup>112</sup> See Vief 143, note 11

<sup>113</sup> Marshall McLuhan, *The Gutenberg Galaxy. The Making of Typographic Man*, Toronto UP 1962

*galaxy* (). There have been two "digital" cultures so far: the *Gutenberg galaxy* dominated by the alphabetic text and printed records, followed by an inbetween "analogue" media culture of signal recording and transmission (phonograph, radio / television). Nowadays we live in a secondary Gutenberg galaxy of alphanumeric digitality (discrete symbols); the binary code, different from the printed book, makes symbol manipulation possible by mathematical intelligence

- in terms of mathematical communication theory, archival value loses its apparent semantic meaning in favour of statistical probabilities. Indeed: "The concept of information applies not to the individual messages (as the concept of meaning would), but rather to the situation as a whole, <...> indicating that <...> one has an amount of freedom of choice, in selecting a message"<sup>114</sup>

- information source in this model „selects a desired *message* out of a set of possible messages"<sup>115</sup> - a virtual archive, with the notion of the archive itself turned upside down. Archives are indeed not simply storage as time channel but primarily defined by their records filtering function which is a quality automated search engines mostly lack

- techno-mathematical diagram can be applied to pre-technical agencies of cultural transmission as well: „The selected message may consist of written or spoken words, or of pictures, music, etc."<sup>116</sup>

- concept of information applies not to the individual meaningful message but rather to the situation as a whole, indicating that "one has an amount of freedom of choice, in selecting a message"<sup>117</sup> - order wrenched from disorder.<sup>118</sup>

- with concept of entropy, classical thermodynamics once expressed the universal trend toward more probable states; archival value creation such as algorithmic data mining as negative entropy

- statistics is still an "archival" (list-based) approach, stochastics (deciphered as Markov chains) shifts the past / present correlation to the present / future by predictive analytics

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114 Warren Weaver, Some recent contributions to the Mathematical Theory of Communication (\*1949), in: Claude E. Shannon / ders., The Mathematical Theory of Communication, Urbana / Chicago (University of Illinois Press) 1963, 1-28 (9)

115 Weaver: 7

116 Weaver: 7

117 Warren Weaver, Some recent contributions to the Mathematical Theory of Communication (\*1949), in: Claude E. Shannon / same author, The Mathematical Theory of Communication, Urbana / Chicago (University of Illinois Press) 1963, 1-28 (9)

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

## Inbetween storage and transfer

- cyberspace not "space" in the Kantian *a priori* sense, but a topo-logical configuration. There are no *lieux de memoire*, rather: data servers and addresses. In the internet, the address structure of communication and the address structure of archival holdings merge into one. Storage becomes functional; „only what has been stored can be located“ - and *vice versa*<sup>119</sup>

- supremacy of selection over storage, addressability over sorting; no memory in the culturally emphatic sense; archival terminology - or rather the archive itself - becomes a literally "metaphorical" *transfer* process; the oxymoronic "transfer protocol" becomes *l'archive* (Foucault)

## For an informational aesthetics of cultural value: (Neg-)Entropy in times of a secondary *Gutenberg galaxy*

- material (archaeological) relics from the cultural past subject to physical erasure and entropy; symbolically encoded information - the cultural technique of preserving musical information despite the ephemerality of acoustic articulation - can be almost time-invariantly transmitted to posterity

- cultural "heritage" in entropic temporality as such; only by classifying the objects and sorting them into groups (increasing information by selecting a message) that physical time is transformed into a symbolic "historical" (which is no real time) order

- media-archaeologically dis-cover the informational value from *within* the objects stored in a digital archive / library or digitized museum objects

- two "digital" cultures so far: the *Gutenberg galaxy* dominated by the alphabetic text and printed records, followed by an inbetween "analogue" media culture of signal recording and transmission (phonograph, radio / television); nowadays a secondary *Gutenberg galaxy* (McLuhan 1962) of alphanumeric digitality (discrete symbols); the binary code though (computing), different from the printed book, makes symbol manipulation possible by mathematical intelligence

- entropy in discrete signal transmission a statistical parameter which measures how much information is produced on the average for each letter of a text<sup>120</sup>; this definition can be widened to every object which is symbolically coded in alphanumeric strings - *vulgo* "digital culture"; cp. telegraph code

- re-phrase a notion like cultural "value" in terms of "the mathematical communication theory" as developed in World War II engineering. All of the

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119 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)

120 C. E. Shannon, *Prediction and Entropy of Printed English* [\*1950], in: xxx, 50- (50)

sudden, value loses its apparent semantic reference in favour of statistical probabilities

"The concept of information applies not to the individual messages (as the concept of meaning would), but rather to the situation as a whole, <...> indicating that <...> one has an amount of freedom of choice, in selecting a message" = Weaver 1949 / 1963: 9. Information (considered as value) is a relative measure of improbabilities. Cultural agencies like the museum are meant to take out cultural commodities (like art works) from the economic circulation of the present in order to increase the probability that it might in future contexts provide for unexpected newness, i. e.: "information" in Claude Shannon's sense. So let us concentrate on cultural value in its engineering aspects.

- mathematical theory of communication can be applied to pre-technological agencies of cultural transmission (cultural techniques) as well: „The selected message may consist of written or spoken words, or of pictures, music, etc." = Weaver 1949/1963: 7

"It is misleading <...> to say that one or the other message conveys unit information. The concept of information applies not to the individual messages (as the concept of meaning would), but rather to the situation as a whole, <...> indicating that <...> one has an amount of freedom of choice, in selecting a message."<sup>121</sup>

- information theory has arisen under the pressure of engineering needs: the efficient design of electronic communication devices (telephone, radio, radar, and television) depend on achieving favorable 'signal-to-noise ratios'. Application of mathematical tools to these problems had to wait for an adequate formulation of 'information' as contrasted to 'noise'. If noise is defined as random activity, then information can be considered as order wrenched from disorder; as improbable structure in contrast to the greater probability of randomness. With the concept of entropy, classical thermodynamics expressed the universal trend toward more probable states <...>. Information can thus be formulated as negative entropy, and a precise measure of certain classes of information can be found by referring to degrees of improbability of a state."<sup>122</sup> Data mining and information value hereby interact

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121 Warren Weaver, Some recent contributions to the Mathematical Theory of Communication, in: Claude E. Shannon / same author, The Mathematical Theory of Communication, Urbana / Chicago (University of Illinois Press) 1963 [\*1949], 1-28 (9)

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