["TEXTS AND NOTES ON ICONITIY"]

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I TECHNICAL IMAGING (nearly edited):

VISUAL IM/MEDIACY: TOWARDS A CULTURAL TECHNOLOGY OF IMAGES

Meta-dating *Laocoon*

If visually interfaced information is not exclusively subject to semantic descriptors any more, the images become informative themselves - by means of operating with values which are, already, intrinsic to the image. In digital culture, the essence of the image itself dissolves into alphanumerical data. At the intersection between analogue image archives, digital image search machines and academic image theories, it is possible to navigate through large amounts of images beyond verbal tagging. Even in the Internet distribution of visual images, it is more text-based than ever in protocols and other alphanumeric codes. Im-mediate access to digitally coded images must not be filtered by words any more; in the Cartesean grid, algorithmic data processing replaces both human mental memory and the ancient and Renaissance *art of memory* (as concluded by Frances Yates).

In the twenty-first century, genuinely computer-generated images have taken the place of photographies which refer to an external world, just like phonographic recording has been replaced by genuine electronic sound generation. Besides subjecting "analog" sound and images to verbal metadescription any longer, the alpha-numerical regime generates audio-visual formats which can be addressed from within their binary (or hexadecimal) code itself, enabling unprecedented orders.

Most radical has been Sandrart´s measuring of the ancient *Laocoon* scultpure group, translating the image from semiotic iconitcity into calculable numbers. Expressing pictures by numbers undoes the old dichotomy between image and metadata; the dichotomy implosdes in algorythmicized space.

The computability of images ultimately derives from Leon Battista Alberti's and Albrecht Dürer's Renaissance perspective scale pictures, based upon the rules of projective geometry. This actually made it possible to calculate pictures out of numbers and rules. A machine can capture an image without any cultural consciousness of the form, by situating the image points in a coordinate system. The apparently continuous image thereby becomes divisible into discrete units; it can be transmited and reproduced. "A code is thus obtained

that comprehends images.This leads one to activate the code and to create new images out of the code language."[1]

But at what level is an image an image at all - a set of data, a format? By human perception, by verbal description (*ekphrasis*) only, or independent from human awareness already? Without human interpretation of certain visual patterns, the image would just be a cluster of data. Optical signals become information „in the eye of the beholder" only, while the computer can deal with the symbolical analysis of physical data only, not with the imaginary.

Like the formation of mental images, images on an electric screen have to be constantly refreshed. Oswald Wiener asks whether it makes sense at all to speak of mental *images*, if they have to be scanned in a time-based process, i. e. as a set of discrete (light-)moments in time.[2]

What digital space allows for, is the option of navigating images in their own medium - without changing the channel, from visual to verbal language. In digital space, the task of *searching images* does not only mean searching for images, but has a second, reverse meaning as well: images that are capable of searching for similar images, without the interception of words. Navigating in *Dataland* (as designed in 1973 by William Donelson), not in the alphabet.

When Chris Marker, in a reflections of his film *Sans Soleil*, tried to remember a January he once spent in Tokyo, he realized that he rather remembered the images he then filmed there - images which had replaced his organic memory (). Thus all of the sudden, and re-activating the ancient and Renaissance *art of memory*, images themselves become meta-data of memory - *searching images* in the active sense.

"Surprisingly little energy has been spend so far thinking on how we interface to images" in a non-verbal way (Lev Manovich). Subvisual knowledge not by meta-dating images, but within the visual endo-data, enters the image itself (data-immersion). In return, information about information generates a kind of second-order visual knowledge: cartography, diagrams, infomapping.

A critique of the notion of „meta-data" draws on the assumption that there is knowledge already within the images, a kind of knowledge which either does not need to be meta-dated or cannot be grasped by verbal description at all - analogous to Otto Rösler´s notion on *endophysics - endo-data*.

„We can tease out some indications of image structure and semantics (for instance, we can find all edges in a bit-mapped image)" (Lev Manovich).

[But a „digital image" is an image no more; what looks like images, is rather a

[1] Harun Farocki, Reality Would Have to Begin, transl. Marek Wieczorek / Thomas Keenan / Thomas Y. Levin, in: Documents 1/2 (Fall / Winter 1992), 136-146 (142), here referring to: Vilém Flusser, Für eine Philosophie der Fotographie, Göttingen (European Photography) 1984. See as well Mario Carpo, Alberti's Media Lab, in: xxx

[2] See the documentary film by Matthias Brunner / Philipp Pape (Berlin), Am Anfang war die Maschine, D 1999

function of mathematical data sets.]

There is a knowledge already implicit, „dormant" within the electronic images, a kind of compressed virtual knowledge, which - different from external inscriptions (meta-data) - waits to be un-covered from within.

Digital data banks, when cleverly adressed, render a kind of knowledge to us which would otherwise be unimaginable in the Gutenberg printed information culture. That is, digital images render aspects of visual knowledge which only the *medium knows*, virtually in the „unconscious" of the data bank. The media-archaeological program is to uncover such *virtual visual knowledge*.

Photo and system: IMAGO, Fischli / Weiss

From the point of view of speculative realism, technical images themselves have a kind of internal knowledge[3] which can not easily be meta-dated verbally. Searching for the ornaments on a carpet for example, or for the colorit of a tapestry, the user of ICONCLASS would fail, since here he can only find what has been indexed by the cataloguer. In a rivalling picture data bank called IMAGO developed by a software company in Hamburg together with art historians in Berlin at least a „hyperlink module" allows, by *drag and drop*, to create non-verbal, rather diagrammatic relations between single subjects and text parts - just like Vannevar Bush's 1945 design of a mechanical *Memory Extender*, microfilm-based on „selection by association, rather than by indexing".

Once "automated", a visual flow can be machinically implemented. Like in minimal music, Fischli and Weiss present a series of images with almost unrecognisable (for humans at least) differential repetitions (phasing). What looks similar to human eyes, is very different by close machine reading indeed.

A visual archive of cinematograpical topoi: Navigating images on the borderline of digital addressability

In most media archives, navigation through images still requires verbal or alphabetical meta-dating. Addressing and sorting non-scriptural media remains an urgent challenge which, since the arrival of fast-processing computers, can be met by digitizing analogue source material. The result is not necessarily better image quality but, rather, the unforeseenability to address not just images (by frames) but every single picture element (each pixel) - just like *our body has become a genetic archive*, now that it has been digitally opened up in the Human Genome Project.

Images and sounds have become calculable and thus capable of being exposed to pattern-recognition algorithms. The notion of „pattern", after all, is derived from Latin *pater* - no matrix but rather a patrix, a patri-archival order (as described by Derrida in his book *Archival Fever*). Such procedures will not only

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[3]   See xxx Mitchell, What do Images Know?, xxx, as referred to in: Ina Blom, Autobiography of Video, Sternberg Pr. 2016

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).

Contrary to traditional semantic or iconological research in the history of ideas, such an endogenic visual archive will no longer list images and sequences according to their authors, subject, and time and space of recording. Instead, digital image data banks will allow visual sequences to be systematized according to genuinely iconic notions and mediatic rather than narrative common-places (*topoi*), revealing new insights into their im/material values. Predominantly scripturally-directed culture lacks the competence of genuinely visual communication; the writer Arno Schmidt envisioned of a box that would make it possible for him to immediately communicate with the visual memory apparatus.

Visual archiving: Sorting and storing images

Pixel by pixel, visual archiving is all about both *sorting* und *storing* images - the archival question.

Cultural memory of images has traditionally linked images with texts, terms and verbal indexes. Confronted with the conversion of images into digital storage gradually non-verbal methods of classification gain importance. It is not the archival question which poses a problem to visual memory; rather the search methods used to find pictorial information are still limited to models which habe been developed for retrieving texts: "Typically, available methods depend on file Ids, keywords, or text associated with the images. <...> they don´t allow queries based directly on the visual properties of the images, are dependent on the particular vocabulary used."[4]

Techno-image archaeology[5] aims at rethinking the notion of images from the vantage point of the process of digital archiving. The archive here is seen as a form of organization of all that can be addressed as information - in so far they determine as well what is allowed to be forgotten.

Cybernetically read, an archive is a coupling of storage media, formats of contents and address structures. In this case the images is to be conceived as data format. Methodologically this implies leaving behind the contemplation and description of single images in favour of an investigation of sets of images.

Returning to Lessing, his 1766 essay *Laocoon or the Limits of Painting and Poetry* discusses the aesthetic conflict between the logic of language and the logic of images in terms of a genuinely muli-media semiotics: painting (*pictura*) is no longer – as declared by Horace – like poetry (*ut poiesis*); time-based media (like dramatic speech and linear narratives) differ from space-based

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[4] Flickner et al. 1997: 7
[5] On technical images and the notion of the techno-imaginary, see: Vilem Flusser, Kommunikologie, ed. Stefan Bollmann / Edith Flusser, Frankfurt/M. (Fischer) 1998

media (like simultaneous two-dimensional pictures). The digitalization of images today provides a technical basis of inquiry into this conflict in terms of the medium computer. How can archives be related to algorithms of image processing, of pattern recognition and computer graphics? Wavelets instead of Fourier analysis?

Paradoxically, metadating blinds its images. Western cultural competence and technology of finding, transferring und processing stored images has been marked by the supremacy of the word as instrument and medium of control and of navigation, such as catchword translation of image contents and the titling of authors and works - a practice which the media-philospher Vilém Flusser calls „Iconoclasm". Iconography is the essence of a text-based grip on images (comparable to Optical Character Recognition), trying to reduce the informational richness of an image to the clarity of verbal semantics.

In sharp contrast to iconography the media-archaeological investigation of image archives do not take images as carriers of verbally expressable meanings. Image processing by computers can no more be re-enacted with the anthropological semantics of the human eye. The starting point is rather a theory based on Michel Foucault´s discourse analysis and Claude Shannon´s mathematical theory of communication, as well as practices and notions of data-structure-oriented programming. A meta-data-free visual memory leads to intuitive visual archives: *modelling* similarity without verbal annotation; instead: query by visual (ex)sample, automatic feature extraction. This model does not replicate human behaviour but media-archaeologically performs data mining. Just throw an image into the computer and see how the computer, orders it - which, finally, might teach humans to take the perspective of computer perception (for a moment at least).

There is no necessity to force the semantic criteria of human image understanding upon the computer. On the contrary, the entirely different criteria of image similarity in computing may leed to unexpected insights in visual culture. Beyond meta-dating, images can be approached in their own technical terms - an interfacing aesthetics based on the difference between human and machine.

The hunger for visual knowledge in the - literally - age of enlightenment led to visual encyclopedias in the eighteenth century already (like the *planches*, i. e. the visual supplement of the big French *Encyclopédie* edited by Diderot and d´Alambert). Photography then has been the switching from printed imagery to genuinely automated visual technology, resulting in the first technical image archives.

Without meta-data, thought, the human mind gets lost within the imaginary museum (André Malraux) of photographic pools. The alternative to the photographic encyclopedia is visual sampling.

When it comes to programming digital data bases, priority should be given to the development of a *visually* adressable image archive by the application of de-ferring algorithms creating different visual sequences and neighbourhoods (the digital *différance*). Operators of image processing and pattern recognition such as filters and invariant transformations can be integrated in the structure

of the data-base in order to make cluster of images accessible by pixel data within, not outside the pictures. Let us have a look at such an image-based image retrieval program developed by the VIPER group at Geneva.[6]

Navigating the visual archive: moving image retrieval

Retrieval is possible only by adressing the image data by an index - *via* an archivial register, metadata. In art historical museums and other kinds of image collections, not the images, just their alphanumerical meta-data belonged to the realm of the archive. There are two divergent, even conflicting archival info-aesthetics.

Instead of endlessly re-arrangable photographic image collections, movies themselves have become the image archives in media culture, ruling image sequences both conceptually (*montage*) and consequentially.

Within the medium film, the practice of montage (*cutting*) has always already performed an kind of image-based image sorting (by similarity, f. e.). Cutting has two options: to link images by similarity of by contrast (Eisenstein´s option). Only video – as a kind of intermediary medium between classical cinema and the digital image – has replaces mechanical addressing of cinematographic images by different means (*timecode*), offering new options of navigating in stored image space. Automated digital linking of images by similarity, though, creates rather unexpected, improbable links: which are, in the theory of information, the most informative, the least redundant ones. It also allows for searching for the least probable cuts.

What happens if that sequence is not being arranged according to iconological or narrative codes any more, but rather in an inherently similarity-based mode, leading to a genuinely (image- oder media-)archaeological montage?

Every film camera shot is already a sequence of images (photographic frames) which, until the cut, is characterized by image similarity. If an image (frame) is thrown into the digitized film images pool, an algorithm is able to contextually detect the most probable shot it is derived from. Once large quantities of film have been archived, such an automatized query will uncover patterns of similarity which human, that is: iconologically-centered image perception (imagination) would not even conceive of - an archive of *signifying* (not signified) *topoi* such as colour distribution patterns and historgrams which are not being externally defined by man (by meta-dating), but inherently by the digital nature of the scanned images themselves, that is: my media-archaeological self-awareness.

Different from the verbal space there is still an active visual thesaurus and grammar of linking images lacking; our predominantly scripturally directed culture still lacks the competence of genuinely filmic communication („reading" and understanding).

Criteria for storing electronic or filmic images have been listed by the director

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[6] *Online-Demo* http://viper.unige.ch/demo/php/demo.php

of the Federal Archives of Germany (Kahlenberg) and the chief archivist of the nationwide public TV channel ZDF (Schmitt); next to economically driven recycling of recordings and historical or political aspects follows, under "gestaltungsbezogene bzw, ästhetische Kriterien": l. „Optische Besonderheiten" (remarkable camera perspectives, such as „Bildverkantung und extreme Auf- oder Untersicht"), 2. „die dramaturgische Gestaltung von Bildsequenzen" (cut, opposition of single frames), 3. „besondere Bildmotive" (landscapes, people) – close to Farocki´s *topoi*. Last but not least, of course, „Medientypische Gesichtspunkte" – the very proper media-specificity, such as a memory of the TV channel itself.

In the marketplace, however, digital video browsing still seeks to reaffirm textual notions such as the story format as segmentation of a video sequence, such as the news story, „a series of related scenes with a common content. The system needs to determine the beginning and ending of an individual news story."[7] Beginning and end though, in technical terms, are nothing but cuts here.

With film, time enterns the pictorial archive. Once being digitized, even the single frame is no more a static photographic image, but a virtual object which is constantly being re-inscribed on the computer monitor in electronic refresh circle light beams. While the visual archive has for the longest time in history been an institution associated with unchangeable content, the memory of (time-based) images becomes dynamic itself. Thus, images get a temporal index.

„Current video processing technologies reduce the volume of information by transforming the dynamic medium of video into the static medium of images"; that is, a video stream is segmented and a representative image is extracted[8] - exactly what indexing by words (description) does.

"Retrieval and browsing require that the source material first be effectively *indexed*. While most previous research in indexing has been text-based (Davis 1993, Rowe et al. 1994), content based indexing of video with visual features is still a research problem. Visual features can be divided into two levels: low-level image features, and semantic features base don objects and events. <...> a viable solution seems to be to index representative key-frames (O´Connor 1991) extracted from the video sources."[9]

But what is „representative", in that archivo-archaeological context? „Key frames utilize only spatial information and ignore the temporal nature of a

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7   Alexander G. Hauptmann / Michael J. Witbrock, Informedia: News-on-Demand Multimedia Information Acquisition and Retrieval, in: Mark T. Maybury (ed.), Intelligent multimedia information retrieval, Cambridge, Mass. / London (MIT) 1997, 215- 240 (226)

8   Atsushi Takeshita / Takafumi Inoue / Kazuo Tanaka, Topic-based Multimedia Structuring, in: Maybury 1997: 259- 280 (259)

9   Hong Jiang Zhang et al., Video Parsing, Retrieval and Browsing: An Integrated and Content-based Solution, in: Mark T. Maybury (Hg.), Intelligent multimedia information retrieval, Cambridge, Mass. / London (MIT) 1997, 139-158 (140)

video to a large extent"[10] - which is exactly the boundary between the iconological and the archaeological gaze, between semantics and statistics, between narrative and formal tropes. Would a visual dictionary still follow the print-model of alphabetic, lexicological order, or does it rather make sense to concentrate on syntax, thus treating semantics as second-order-syntax?

Search & destroy

In automated systems, the image is meta-dating itself, automatically; the meta-data are *within* the image.

In a film called *Eye / Machine*, Harun Farocki draws attention to *operative images* in so-called intelligent weapons which become data-driven by matching images, not by meta-data any more. That is why Farocki does not link the images of his recent film *Reconnaissance and Persecution* by massive verbal commentaries any more, but the self-linking of images itself mirrors the techology which is the subject of his film - which in the meantime has become culturally driven for knowledge research in so-called "Digital Humanities".

Memory games: A media archaeology of curiosity cabinets

The computer software called *2gether1 - Das Mosaik Tool* (by the company Games2Play,Hamburg) composes mosaic-like large-scale images based on the mean colour values of a pool of miniature photographies.

Today, auto-associative networks are implanted into microchip circuitry, "an electronic switch-principle for visual memory, as is being discussed for the cortex. Auto-associative networks, now under theoretical study by computer scientists, have properties that are comparable with visual memories. You have to imagine a matrix of parallel-switched neurons whose synoptic links react on themselves in loops with the aim of being able to store a great deal of content at the same time."[11]

The Warburg paradigm?

Computer-based "visual analytics" attempts at a serious memory game when identifying visual formulas in occidental art history, a kind of visual sub-conscious of collective cultural memory which escapes human iconography. Although Aby Warburg´s *Mnemosyne Atlas* (ca. 1929) looks primarily iconographic at first glance[12], its coupling with new digital image-sorting

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[10] Zhang et al. 1997: 149

[11] Jeanette Schulz, in conversation with Hans Ulrich Obrist, in: ars viva 00/01 - Kunst und Wissenschaft, catalogue to the exhibition of prize winners of Kulturkreis der deutschen Wirtschaft (Bundesverband der Deutschen Industrie e.V.), October to December 2000, Staatliche Galerie Moritzburg Halle, Berlin (Katalog) 2000, 27

[12] Fig.: Vitus H. Weh, Dokumentationstaumel. Ausstellungskataloge und ihre Ordnungssysteme, in: Kunstforum International vol. 155, June/July 2001, 277-

programs opens up genuinely new perspectives - a productive tension between the traditional image-content based approach and a media-archaeological approach which privileges a genuinely data-based method of ordering images where the reproductions, provided with numbers, can be constantly re-arranged and re-configurated. Just like the famous Warburg file catalogue (*Zettelkästen*) translated both texts and images in alphanumerical notations, the digital matrix allows for "hypermedia" (Ted Nelson) links of visual and verbal information.

When it comes to sorting visual gestures, there has already been a recording medium which Warburg surprisingly did not acknowledge: silent film (until 1928). In early film, there prevailed a sorting of image sequences, by linking of dynamical gestures, while the static textual meta-data (descriptions, dialogues) were interpolated, remaining clearly separated from the visual flow. With sound-equipped film, the supremancy of language entered the space of the images itself - both technically (sound track attached to the single frames) and perceptionally. Even today, many automated search operations (as for news broadcast archives) are based on the speech recognition of the clippages (searching for key-words uttered by the anchor-men), not genuinely on visual recognition.

Image archives on the threshold of their digital approachability[13]

The real iconic turn in metadating images is still to come - a visual sorting of images on the threshold of digital image processing and retrieval. While visual and acoustic sources contain types of information and aesthetics a text can never convey, the book or the digital text as a verbal research tool have been much easier to handle comparatively than large amounts of images and sounds; that is why the library is still the dominating metaphor of cultural memory in the West. Since calculating and storage capacities of computers have increased significantly, they can become active agents in digital image archaeology by functions like „searching images". Instead of having to meta-date images by words, we can handle the data within the image itself; whole audio-visual archives thus become calculable (at least on the level of pixel or scan values). Images and soundtracks can therefore be made accessible in their own medium, if only perfectly adequate algorithms of shape and pattern recognition are being made available.

By statistical operations, qualities can be made evident which have never been seen before in images. All of the sudden, images can be retrieved in their own properties and right - that is, not only by the grace of the accompanying text. After a century of building up audiovisual archives alternatively to textual libraries, the cultural challence now is how to approach these archives in a media-appropriate way - analogous to traditional verbal dictionaries, but organized in a non-alphabetical order (authors, subjects) or even dis-order (ergodically). Actually, the mathematician David Mumford has reduces the

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[13]   Based on W. E., An Image Lexicon of Cinematic Topoi. Film on the Threshold of its Digital Approachability, transl. Andrea Scrima, in: KW Magazine 01/01 (2002), 10f

vocabulary of picture elements (would be pixels?) in Western visual culture down to 23 elements - just like the letters of the (Greek) alphabet.[14] Image-endogenic systems of classification replace meta-dating, such as geometric topologies of image or even cinematographic sequences. Whereas previous image sorting in a primarily writing-based culture has so far been clearly iconologically orientated (see Erwin Panofsky), computing now offers the possibility of applying non-semantically operating image-sorting programs which rather recognizes formats and creates a strictly form-based image assortment (see Heinrich Wölfflin, and Foucault´s reading of Manet´s paintings). Image-based image retrieval operates in harmony with the mediality of electronic images, for in electroniv memory, we don´t have to direct image by meta-data exclusively, but we can open them up immediately according to their genuine optical statements. One digitized, images can be visually calculated and internally navigated.

Pixelling the image

Images have traditionally resisted all human attempts to describe them exhaustively. Once digitized, images now can be "described" with ultimate precision, addressing and calculating their pixels and colours. In the MPEG-7 format, the image elements are stored along with both technical and semantic metadata. Images are being understood themselves as data sets - a cluster of pixels. Not the images themselves, just their metadata belong to the realm of the archive. Calculating images, MPEG-7 allows for "layered" image composites and discrete 3D computer generated spaces; the shift is from a "low-level" to "high-level" metadata describes the structure of a media composition or even its semantics.

But on the contrary, in order to retrieve digital images by image content, we have to insist on the computability of the imagined world. For monitoring sytems to process a large amount of electronic images, such as human faces, such systems have to get rid of semantic notions of *Gestalt*.

This is why the IBM QBIC system (Query By Image Content) does not try to radically decide in the quarel between semantic *versus* non-semantic information, but rather to distribute the task according to the respective strength in the human-machine interface: "Humans are much better than computers at extracting semantic descriptions from pictures. Computers, however, are better than humans at measuring properties and retaining these in long-term memory. On of the guiding principles used by QBIC is to let computers do what they do best – quantifiable measurements – and let humans do what they do best – attaching semantic meaning"[15] - which establishes a feedback-loop between man and machine and stages the difference between analogous and digital data processing, thus not trying to efface, but to creatively enhance the human-computer-difference where they meet on the interface.

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[14]   See his *Algebraic Geometry* und his *The red book on varieties and schemes* (1999)

[15]   Myron Flickner et al., Query by Image and Video Content: The QBIC System, in: Maybury 1997: 7-22 (8)

The topic of "Meta-dating the Image" is a subset of the larger theme of DEAF 003 - "data knitting", which reminds us of the first digital image production by the Jaquard loom in France around 1800, providing the idea for Charles Babbage´s first computer design.

See the pixel works of the media artist Angela Bulloch: In her installation *Blow up TV* she uses a key visual, a sequence from Michelangelo Antonioni´s film *Blow Up* (1966): the protagonist, a photographer, hiding behind a tree taking photos to discover a murder; but in trying to identify the spot, the closer the camera looks, the less is the apparent murder an evidence. The artist extends this process of identification by yet another magnification, enlarging the digital scan of this scene in great blocks of its single pixels. Thus the image *implodes* by slowing down the cinematographic motion to one digit per second (thus undermining the copyright which is based on the recognizability of the motive for the spectator), and on the other hand the original image *explodes* within a sequential modular system of purpose-build so-called *pixel boxes*, where one pixel is represented in a 50 x 50 cm monitor which are attached to complex RGB lighting systems which can be generated and programmed with any digital information[16] - a desillusion of the image betrayal of the human eye, reavealing the scanner-gaze of the computer which is media-archaeological, looking at a different kind of archive, not looking for letters any more. The pixel modules point at the fact that digital images are hyper-indexically composed by pure information, as opposed to the referential image like the classical photography which still suggest a pre-discursive real.

Beyond culture?

Visual search engines that can truly deal with iconological queries are still in their infancy - for example *Cobion* in Kassel, crawling the web for illegal trade-mark copying. So far, the similarity-based images retrieval technology is either militarily or commercially, not really culturally driven (as has been frequently emphasized by late Friedrich Kittler).

"Contentism" is the iconological heritage and cultural burden which still semantically hampers truly algorithmic approaches to image collections. "[T]he metadata provided by an image database software I use to organize my digital photos tells me all kinds of technical details such as what aperture my digital camera used to snap this or that image – but nothing about the image content" (Manovich). A techno-mathematical approach to image analysis and synthesis may liberate occidental culture from its inherited contentism.

While computerization made the image acquisition, storage, manipulation, and transmission much more efficient than before, it did not help us so far to deal efficiently with the automated description and access to the vast quantities of digital image being generated by digital cameras and scanners, by the endless "digital archives" and "digital libraries" projects around the world, by the sensors and the museums ... - unmanagable by human manpower any more.

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[16]   Such is the installation *BLOW_UP T.V.* of Angela Bulloch in the gallery Schipper & Krome, Berlin, September to November 2000

UNMASKING INTERFACES. Archaeological moments of visually mediated knowledge

The *prosopopoietics* of inter"face"

The term and the practice of *interfacing* still adhere to an anthropomorphic discourse, while a non-metaphorical use of „interface" liberates machines from rhetoric, separating metaphorical interfacing from its technical functions, de-anthropomophising technical media from the ways they are being *personalized*.

The criminal archive has long resided on photographic portraits of delinquents or of collected fingerprints. The iconic or indexical paradigm nowadays is *dataveillance*. Even if these data sets are still phenomenally generated as „images" on interfaces (computer monitors), they can hardly be called „images" any more. The identification of some 2200 victims of the WTC attack could only succeed by comparative DNA analysis, in order to be able to literally sort (or assemble) 14.000 found fragments of corpses. When the faces are destroyed, they are being replaced by the data "mask".

The basis for symbolically coded communication are alphabets or numeric data (even if masquerading in the guise of images). The literary genre of „ghost talk" in European Humanisms and Renaissance (Macchiavelli, Petrarca) has been as a genuine function of writing systems. Script-based society trusts into the possibility of storing intellectual energy in writing which can be synchronically re-activated across time by reading.[17]

Deferred interfacing of knowledge: letters

"By letter we may absence make / even presence selfe to be.
And talke with him, as face to face, / together we did see" (William Fullwood, The Enemie of Idleness, 1582). In letter-based communication, the partners have always been aware of the temporal delay when taking a letter into their hands; such delay tends to be effaced in "live" tele-communication. For the telephone, the answering machine has been a *re-entry* of the postal message - *Voice-Terminal-Echo* (Jonathan Goldberg).

Telematic communication gererates - technically formulated - depersonalized forms of interfacing; partners of communication have become signals and ciphers of addresses. Michel Foucault imagines the human face vanishing in the sand - a sand which is *silicon*.

Loose and tight interfacing

The printing revolution created a complete reconfiguration of interfacing knowledge. The function of the interface is *coupling*. A loose coupling would still be identifiable as „medium", according to Fritz Heider, and the tight

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[17] Aleida Assmann 1999: 124

coupling freezes into „form".

The term *communication* usually points to oral communication, automatically thought of as a two-person game. "This may extend to letter writing. For printed communication, however, it is completely inadequate."[18]

"Once writing is defined as a symbolic trace in a receptive material, signs are perforce transmitted through a technological interface. The book is an interface no less than a way tablet or a woodcut print. But from the woodcut to the computer, we have come to require machinic arrangements of greater and greater complexity to translate representations into visible and sonic arrangement our bodies are capable of perceiving."[19]

The acoustic medium provides for the tight coupling of noises, the optical medium provides for the tight coupling of things. Under the title *Simulationspace* the media art group Knowbotic Research installed a *Mosaic of mobile Datasounds*, an interactive walk-in sound data space, collected through the Internet, installed at the Ars Electronica festival in Linz (Austria) 1993, later at the Siggraph ´94 in L.A. Here, the visitor navigating a "datascape" missed the usual feeling for orientation; „the composition of the information in the darkness reveals new clues of perception, new sense of space, the processing of information.

Medieval heraldy and parchment as interface

While culture has developed a series of metaphorical machines, media archaeology focuses on the disruptive discontinuity between such cultural techniques and truly techno-logical devices.

Every screen is not transparent, but a shield, hiding its material, technical or logical infrastructure - hiding by showing. The task of media archaeology thus is an act of un-covering. Hypermedia dramaturgies, starting with TV and video and resulting in the digital worlds, consist of surfaces everywhere. These surface phenomena, though, can not be opposed to a hidden interior, since no semantic depth is intended. They are what they show. When the Universal Turing Machine renders data for display, this is not metaphorical, but its direct enunciation.

Iconic / idiotic interfacing

In pre-modern times, images as *ikones* communicated to the illiterate. Such icons have returned on the computer screen. Umberto Eco, in his essay „MS-DOS is Calvinistic", opposes the (nowadays prehistoric) MS-DOS interface user to the Macintosh User, mirroring the schism between catholicism and protantism in Christian religion. The Calvinist version is concentration of

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[18] Luhmann 1992

[19] D. N. Rodowick, An uncertain utopia – digital culture, in: Claus Pias (ed.), Medien. Dreizehn Vorträge zur Medienkultur, 1999

information on the alphabet, equalling programming, while the Catholic version is counter-reformation by iconicity.

Icons are functional pictures used by computer graphics designers on the media scene of the man-machine interface. Even if iconic communication might historically be the most natural, earliest form of symbolic communication, the archaeology of writing indicates that complex cultures require symbolic interaction by more abstract signs, such as numbers and the alphabet. Since Alberti, images have become a function of mathematics - the linear perspective, as explained in Dürer´s *Anweysung zur Meßkunst*.

With clickable icons, programming-as-writing and the simulacricity of interfaces may coincide, when it comes to *visual programming*. Iconic programming environments make diagrams (or pictograms, graphical notations) transitive: they do, what they metaphorically indicate, thus being metaphorical no more in a rhetoric sense, but in a technical meaning of data transfer. Programming is carried out simply by arranging icons on the display. Here, "objects which the system deals with such as data and program are represented in terms of icons. Programming is carried out simply by arranging icons on the two-dimensional display screen and specifying flow of data."[20] Icons are not just small images on a display to visually assist the communication between user and machine, but they are conceputal objects "including both an object consisting of an icon image displayed on the screen and the functional description associated with it such as a program code and a data value"[21]; the icon, in its semiotic sense, here bears resemblance with the coding as a kind of visual short-cut of algorithmic lines. But the way images are being processed in the human brain disguises how they are algorithmically generated from within the computer: "An image is captured as a whole. It is processed in a parallel manner, and the semantics are entered into long-term memory. <...> The speed of image processing and the accuracy of image recognition are two factors on which an iconic-based man-machine interface can capitalize."[22] But icons may be much more culturally ambiguous than the mathematical codes they dissimulate. Is a virtual machine like the BALSA (Brown Algorithm Simulator and Animator) a simulation or a performance of such proceedings? Monitoring of programs in execution by such visualizing tools can lead to immediate interaction with the program observed, and thus advance from simple displaying / viewing algorithms in execution to actually control it. The visual paradigm means monitoring the execution of an algorithm in the cybernetic sense (communication resulting from feedback + control), comparable to the Williams tube in early computing (which did not only visualize but actually physically perform storage / time-delay functions).[23]

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[20] Tadao Ichikawa / Masahito Hirakawa, Visual Programming - Toward Realization User-Friendly Programming Environments, in: Glinert (ed.) 1990
[21] Ibid., 61
[22] Kenneth N. Lodding, Iconic Interfacing [*IEEE Computer Graphics and Applications, Vol. 3., No. 2, March/April 1983
[23] See Marc H. Brown / Robert Sedgewick, A System for Algorithm Animation (1984), reprinted in: Ephraim P. Glinert (ed.), Visual Programming environments: Aplications and Issues, IEEE Computer Society Press 1990

Temporally dynamic interfaces are manipulating temporal knowledge: „BALSA provides facilities for displaying multiple views of data structure, all of which are updated simultaneously during program execution to give a motion picture of the program in action."[24] Interfacing history: "BALSA could replay its saved history of interesting events and the view would update itself incrementally as if the program were executing. This method has the problem that one might not be interested in what happened in the algorithm over history; rather the current state is of interest."[25]

Users of the operating system UNIX, by applying the order HISTORY, can re-call a chronicle of terminal events - a visual history, providing for temporal transparency. The *RAND Corporation*, in trying to automatize military simulation games, called this *synthetic history*.[26] Interfacing knowledge thus transforms from intransitive (i. e. without a direct object, from late Latin *intransitivus* , literally "not passing over") to transitive communication („passing over") - communication with no interface any more, like the non-symbolical archiving f. e. of biometrical data (fingerprint) on passports?

Visual knowledge?

Radar once extended perception beyond the optical horizon of the visual, while at the same time reducing perception on decisive data or identification and control. Still, the optical metaphors stubbornly survive. Radar signals are being represented by the cathode ray tube visually, thus establishing an interface between the technique of radar and its human interpreter.

Complex data clusters, when represented in abstract symbols and data strings, can hardly be comprehended by human reading any more which is too slow. For the sake of human understanding, they are being abbridged by images. Knowledge and seeing converge, both etymologically and in the act of decoding. The early design of a visual interface called *Dataland* in 1973 resulted from the wish to create a multi-media data bank where information could be spatially processed and retrieved - without using key words or logic or relational criteria. On the computer screen there emerged a virtual surface with visual symbols (icons) representing different forms of data quantities (William Donelson).

Unmasking inter"faces": From visual interfacing to *monitoring data*

Civil use of computing needed to create interfaces as user illusions. "At PARC we coined the phrase 'user illusion', to describe what we were about when designing user interface", Allan Kay confesses in his essay „User Interface: a personal view". Neither visual properties nor similarities can guarantee the meaning of an icon, but their advantage is that they suggest to the user who

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[24] Brown / Sedgewick 1984/1990
[25] Brown / Sedgewick 1984/1990: 119
[26] See Claus Pias, Synthetic History, in: Archiv für Mediengeschichte, Weimar (2001), 171-183 ; online Version https://www.uni-due.de/~bj0063/texte/history.pdf (accessed September 2017)

might me completely ignorant of machinic procedures the option of directing the machine. Thus icons fulfil the traditional task of transfering coded commandments to persons who don´t know this code. What is the alternative? Transforming users into programmers? But icons themselves might become a form of knowledge, as already practiced in scientific techniques of visualization. To be more direct: The „black box" of the computer, its hardware, might be iconized down to its most minute register, in order to turn - analogous to Cusanus´ notion of the *icon* - the reading of the central processors into seeing, that is: making them visible, transparent.[27]

Visual and sonic navigation in dynamically generated information landscapes are central tasks for multimedia designers. But do interfaces necessarily require audio-visual orientation, or is a mathematical interface thinkable, as visioned by Leibniz - interfacing knowledge in logical space?

The media art collective Knowbotic Research (KR+cF) devised a knowledge space to represent the Antarctis, a model of a Computer Aided Antarctica. "KR+cF in its DWKTS installation, limits the material to the available computer-processed information on current antarctic research as it appears in public data networks. [...] the data space give rise to phenomena which are difficult to conceptualize - a Computer Aided Reality. [...] KR+cF designs knowbots, devices operating as spatially and temporally dynamic interfaces for the observer's interactive navigation through the information landscape."[28] Since the Antarctis as data pool actually happens outside the Antarctis, as artificial nature in data representations of measuring and sensoring instruments covering this area and procuding, every second, a stream, a flood of data (like satellite vision). These informations tend to become independent and can be grasped and administrated only by articial intelligence agents (learning algorithms, so-called knowbots) in computer networks. These agents, in the mentioned installation, create out of the flood of information images from the south pole. The data body of this Cyber-Antarktica is based on temperature data and Ozone values - scientific material which has lost any deep sense or semantic meaning (ibd.), thus rather equalling the Shannon- than the cultural studies-like notion of communication. Visual, interactive data clouds instead of fixed interfaces, as explained by Christain Huebler in „Discovering CyberAntarctic": "Our installation 'Dialogue with the Knowbotic South' [...] is based on knowbots, which generate a vision in a data-network. They originate a hypothetical nature, a Computer Aided Nature (CAN). [...] We have designed a visual form for every knowbot's algorithm corresponding to the data sets. [...] We do not have an interface any more, a mechanical interface, in the real world, we have interfaces in the network, the dynamic network."

Finally, visual interfaces become redundant in machine-to-machine-communication. The coupling of knowledge to visual interfaces generates *monitoring* in all senses (panoptical survey) - the option of tele-control, control in distance. But is there any transparency beyond the monitor(ing)? Digital calculation beyond the individual subject refers neither to the differential symbolic order represented on the screen nor to a world outside this screen

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[27]   See Stefan Heidenreich, Icons: Bilder für User und Idioten, in: Birgit Richard / Robert Klanten / S. H., eds., Icons - Localizer 1.3, Berlin 1998

[28] Blast 1996; http://www.krcf.org/krcfhome/1dwtks1.htm

(physical reality behind the screen is chips and current only); the digital machinery retreats into total untransparency, invisibility (Slavoj Zizek).

Knowing = telling?

Knowledge has become the skill where to find information about it: *infomapping*[29] - diagram rather than image, from *storing* data to *sorting* data. *Information*, as defined by Shannon and Weaver (1949), has come to mean the combination of data into messages intelligible to human beings. But this understanding does no longer necessarily requires a narrative shape - which is a culturally specific form of ordering knowledge in (linear) time. To know is to recognize differences, in its most radical technologica reduction to tell 0 from 1, digitally. The ultimate interface is the one between the physical and the logical world, the anlogue-into-digital transformer.

Interfacing *time-based* knowledge

David Gelernter proposes the data flow of *lifestream* as a future alternative to the desktop-metaphor of present computer interfaces. The dominant mode of actual knowledge is transitional, transitory, equalling the form of the electronic current itself - a literal „liquidation" of spatial metaphors to temporal ones. Instead of emphasis on spatial memory (on hard disk) „the Lifestreams system treats your own private computer as a mere temporary holding tank for data, not as a permanent file cabinet"[30]. Future and past become just segments, functions of a floating interface differentiating data flows. Analog electronic screens are time-windows already.[31] The computer-screen, though, is a monitor in time, *interfacing time*. Images, symbols, data, points and pixels which appear on the present time window of the monitor and disappear as fast, sink back to the memory, from where they can be re-called every moment into a ever repeatable re-presentation. Once quantified, time is fragmented, becoming divisible into smaller and smaller usable bits (Götz Großklaus).

Dan Graham's video installation *Present Continuous Past* (1972) interfaces the presence of the audience by delay. Narrative time in Bill Viola's video installation *Slowly turning Narrative* (1992) is being replaced by a technical *close circuit* between camera and monitor, with deferred time. In Gary Hill´s video installation *Inasmuch as it is Always Already Taking Place* (1990) video tapes whose time code (numbers) remains visible are being rewound again and again. And in Viola's video-installation *Heaven and Earth* (1992) two monitors mirror each other *in time*, one (with a baby´s face) mirroring the other (a old, dying woman's face)[32] - interfacing time itself.

Against the invisible interface: aesthetics of *enhancing the difference*

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[29] Bolz 2000: 131
[30] David Gelernter, Machine Beauty. Elegance and the Heart of Technology, New York (Basic Books) 1997
[31] Großklaus 1994: 55
[32] Belting 1995: 97

between man and machine

Is the transparent interface a medium? Aristoteles writes *to metaxu*, literally the „inbetween". It becomes obvious only in moments of breakdown: "Objects and properties [...] arise only in an event of breaking down in which they become present-at-hand. <...> A breakdown is not a negative situation to be avoided, but a situation of non-obviousness, in which the recognition that something is missing leads to unconcealing <...>. This creates a clear objective for design - to anticipate the forms of breakdowns and provide a space of possibilities for action when they accur."[33] The interface can become a zone of conflict; only irritation reveals the technical medium to the human senses.

But current interface design heads towards the oblivion of hardware by software operations, in order "to break free of the computer, to break free conceptually. <...> Cyberspace is unlike any physical space. The gravity that holds the imagination back as we cope with these strange new items is the computer itself, the old-fashioned physical machine. <...> every key step in software history has been a step away from the computer, toward forgetting about the machine and its physical structure and limitations – forgetting that it can hold only so many bytes, that its memory is made / of fixed-size cells, that you refer to each cell by a numerical address."[34]

Interfaces

What if the interface is not transitive, but intransitive? When the screen does not simply translate signals or information from computer hard- and software to visibility, but is in itself the message? The television screen has been a media scene for critical interface exerimentation: "Everyone should have as many controls as possible to permutate the size, shape, and color of what they're watching. [...] generally they're offered to "adjust" a picture which is thought to be abnormal, rather than to create your own electronic kaleidoscope. However, one thing you can do is draw a magnet across the face of the picture tube. This messes with the magnet field on the picture tube and distorts the image (without damaging the set) at your control."[35]

On the computer screen, all space becomes an abstract computational space, and all time becomes abstract algorithicized time. At the heart of digital computing, there is interfacing to the external signal world by translation already, the transformation of physical reality into coded data (that is, whatever can be „read" by the computer). The world is abstracted into binary values (embodied as voltage); whatever cannot be translated into numbers, literally *does not count*.

Interfacing as metaphor / translation

The keyboard or the monitor of a computer are interfaces for communicatio

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[33] Winograd / Flores 1986: 36 u. 165
[34] David Gelernter, Machine Beauty, New York (BasicBooks) 1997
[35] Shamberg & Raindance Corporation, Guerilla Television, 1971

between human and machine which transform between different states or representations. However, also parts of software are interfaces which allow for communication between two or more programs written in different languages. In contrast to the hardware case, the software-to-software interface can not be physically, only logically localized. It is the functionality behind it that allows to speak of an interface.

"A computer monitor <...> is a cascade of interfaces that transforms internal electromagnetic states via data buses, oscilloscope, fluorescent material etc., to electro-magnetic states in the visual range of wavelengths. A purist may write down a [partial] differential equation of the whole thing on a microscopic level where the notion of an interface seems to become rather arbitrary. It seems, that the intuitive notion of an interface is a relativistic concept."[36] Even the present "now" is pure interface for the integration of different temporalities.

Interactive interfaces

"Machines, instruments, dispositives were built to deceive the eye. The new dispositives will deceive the brain. For that new interfaces have to be developed [...]."[37] In military action, smart bombs that interactively check observations of the terrain against a stored map of their routes are `smart´, i. e. they „know" as soon as they are able to enhance algorithms with interaction, while traditional linear algorithms are metaphorically dumb and blind because they cannot adapt interactively while they compute.[38]

Transitive interfacing

In *Alice in Wonderland*, the protagonist jumps down into the Looking-glass room. The ultimate interface would be the abandonment of interfaces, the immediate sending of sensual data from computer to human senses / nerves, constructively: no simulation any more, but cerebral stimulation. As opposed to traditional *mimesis* (mirroring reality), such an interface *generates* (virtual) realities - from mirror to monitor. The notorious Turing test though requires an interface between man and machine, a teletaper (as proposed by Turing in „Computing Machinery and Intelligence"), since direct coupling between man and machine is (still) not yet possible.

There is a media-epistemic rupture as well in the temporal sense: When compared with most traditional physical interfaces, which remained relatively stable over long periods of time (like the book page), the digital (virtual) interface is uniquely open to reconfiguration and radical redesign. Current interface design still metaphorically (or iconically) mirrors or "re-mediates" (Bolter / Grusin) the old media aesthetics (following McLuhan's law), like the

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[36] Hans Diebner, Timothy Druckrey and Peter Weibel [ed.], Sciences of the Interface. Proceedings of the International Symposium, preface
[37] Peter Weibel, director of the ZKM - Center for Art and Media Karlsruhe, Germany, on *The Art of Interface Technology*
[38] Peter Wegner, Why interaction is more powerful than algorithms, in: Communications of the ACM, vol. 40, no. 5, May 1997

„folders" in current windows still conservatorily mirror the bureaucratic, archival paradigm of administering knowledge, new forms are genuinely information-based. As long as the key-board of computers is alphabet-based like a type-writer for printing just letters, the paradigm of printing remains dominant.

Just like the media theoretician professor O´Blivion says in David Cronenberg´s movie *Videodrome*: The electronic image from the screen is mirrored by the retina of our eye and can be transferred from there to the computer screen. Electronic signals invade bodies by the very physical act of perception. All of the sudden, the interface is within. The future will be the transition from exterior to interior interfacing. The term „immersion" indicates the dissolution of the interface as such. The dialogical model is replaced by the immediate.

MEDIA ARCHAEOLOGY AND / OR ART HISTORY. A *liaison dangereuse*

The technical gaze reminds of alternative ways of looking at "works of art". By its close reading, media-archaeological criticism de-narrativizes artefacts of figurative art. Such an analysis of the material and cognitive *arché* suspends the physical object from metaphysical concepts behind like (art) "history" as well. This is not a nostalgic return to traditional antiquarianism; the neo-antiquarian gaze is rather non-human and computational in its "Digital Humanities" sense. The "cold" algorithmic sorting of images results in a different kind of *musée imaginaire*.

Introduction (en Français)

Média archéologie radicale

D'abord une clarification: Il y a des média-archéologies multiples par definition des auteurs divers; comme methode et comme discipline, la média-archéologie est encore *en emergence*. Moi je propose une version radicale de média-archéologie, en sens littéraire de "radical": *radix* en Latin (et *l'arché* en Greque) est le début, l'origin en sense temporel, mais aussi la racine en sens mathematique, le symbole "√". L'archéologie est l'analyse des structures, ne pas des surfaces phenomenales.

La notion du *média archéologie* a un double sense: "l'archéologie *des* médias technologiques", mais aussi l'archéologie *par* les médias, le point de vue techno-mathematique. Le regard et l'opération média-archéologique est d'abord une de-culturalisation[39], un act de "re-presencing" (Vivian Sobchack), et une de-historization des oeuvres de l'art.

Je ne vais pas discuter les effets indirectes des nouvelles technologies (comme la photographie ou le film) sur les oeuvres de l'art traditionelle comme la peinture et la sculpture depuis le 19ème siècle; cette influence est déjà bien integré dans les recherches historiques de l'art moderne.

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[39] See Claus Pias (ed.), *Kulturfreie Bilder*, Berlin (Kulturverlag Kadmos) (à publier)

Aussi je ne vais pas thématisier *media art* ou l'effet technologique sur l'esthetique est evident.

Il n'y a *pas* une rélation directe entre les études des oeuvres de l'art classiques et l'archéologie des média en sens de technologies. La média-archéologie *respecte* les euvres de l'art (la peintiure, la sculpture) comme un *autre*

- même, dans un sens surprisant, la naissance de la théorie des média était directement inspirée par le Critique de l'Art. Le théoreme central de *Understanding Media*, la publication fondatrice des études médias par Marshal McLuhan (1964) est que "Le médium est le message"; explicitement cette notion était inspirée par la characterisation de Clement Greenberg de la peinture moderniste. Média-archéologie aussi attend pour le "méssage" inscribé dans l'oeuvre de l'art, au-dehors l'individuation subjective et intentionel, mais plutôt en sens iconologique propre: des relations numérique (géometrie algebraique en sens de René Descartes).

Les liaisons entre la média-archéologie et le champ artistique sonst plus subtile - même "dangereuses" au niveau epistémologique. Cette provocation concerne le concept d'une *histoire* de l'art. A ce point je veux souligner que je ne suis pas un critique de l' histoire de l'art comme discipline academique, au contraire: Il y a une necessité pour une historiographie de l'art en sens de la contextualisation des ouevres esthétiques sur la base des archives documentaires.

Du point de vue historiciste, si l'histoire existe, il faut historisier le discours historique. Pour ca if faut prendre un point distante (critique): (media-)archépologique.

La relation entre média-archéologie et l'histoire de l'art est une "liaison dangereuse" parce-que "l'histoire" est mis-en-question par l'approximation media-archéologique des ouevres de l'art du passe, en faveur de decouvrier par des actes "archéologiques" des autres sedimentations du temps en pluriel ("Zeitschichten" en sense de l'historien Reinhart Koselleck).

L'exercise archéologique est le regard non-historiciste sur les objects; plutôt: le regard *temporalisante*, pour laisser s'articuler le temps-propre ("idéosyncratique") des oeuvres.

La média archéologie plutôt prend une point de vue *complementaire* (ou même alternative) à l'histoire des articulations esthétiques; le regard média-archéologique sur les ouvres de l'art du passé est radicalement non-historisante.

Attendons les peinture derivée de la passé. Le regard non-semantique sur les images artistiques: est-il possible? Pour la première fois, tels objets des musées de l'art peuvent être "interpretée" comme *imaging* par des machines, au-delà du regard anthropocentrique.

Dans la definition du "techno-imaginaire"[40] par le philosophe des médias Vilém Flusser, avec la numératisation des images, ils devient encore des "textes", et leur historicité est effacé. Aussi pour Jean Baudrillard, pour la photographie digitale, il n'y a pas du sense encore de parler de "photographie".[41]

Sélon Flusser, images traditionelles sont pre-textuelles, pre-historique (" prae-historisch,"), tandis ques techno-images (" Technobilder ") sont basées sur des textures alphanumériques, ils sont post-historiques ("post-historisch").[42]

Laissez-nous, pour un moment, suspender l'analyse des euvres de l'art de la hermeneutique des sciences humaines, en faveur d'une scientification - mais afin que dans un deuxième sense ces evidences positivistes sont reliès à l'analyse epistémologique.

Car les methodes métriques de l'investigation des oeuvres de l'art ne sonst simplement des technologies auxiliaire pour l'analyse. Dechiffré avec le point de vu média-archéologique, ces opérations sont des évenements et moments epistémologiques au même temps. Ils decouvrent le *momentum* de ce qui passe quand l'homme-auteur (l'artiste) est couplé avec la physique et le logique des matérialités appliques.

Média-archéologie pose la question: Comment les opérations calculatrice sur l'image (*image processing*) affectent la notion de l'histoire de l'art au niveau epistemologique?

[Les computations des oeuvres de l'art par les methodes des "digital humanities" sont statistiques et basées sur une epistémologie algorithmique. Est-que c'est encore humanisme numérique ("computational humanism", Roberto Busa)? En différence aux "Digital Humanities", la média-archéologie des objets d'art passé regard la materialité aussi; ce n'est pas reductrice aux opérations calculatrice. Il y a une relation *inductive* (expression electrique) entre la qualité esthétique et la qualité materielle (téchnique) d'object de l'art.]

La tension média-archéologique entre la peinture et la photographie

Walter Benjamin avait déjà interrogé la transformation de la peinture par la reproduction photographique: *aura* perdu). L'influence de la photographie sur l'(histoire de l')art est multiple:

Média-historiquement, il y avaient des nouvelles definitions de l'esthétique de la peinture (sa fonction de la *mimesis*) par l'ìmage indexicale de la photographie. A ce point une définition distincte: L'euvre de l'art n'est pas un *medium* en sense technologique. Peinture et sculpture sont des techniques culturels - toutes liées au corps humain (les mains, le regard, la procession

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[40] See Vilém Flusser, Into the Universe of Technical images [1985], Minneapolis (Univ. of Minnesota Press) 2011

[41] Jean Baudrillard, Pourqoui tout n'a-t-il pas déjà disparu?, Paris (Les Éditions de l'Herne) 2007

[42] Flusser Archiv, University of the Arts, Berlin, typescript "Von der Zeile ins Bild (zurueck)", 3

cognitive). Mais technologie est l'autonomisation des la technique, l'automatisation; un scène fondatrice était la "liberation" des images mondiales du geste humain de la peinture par le procesus kalotypique de la photographie.

Voyons, par example, le film actuel *Mr. Turner* (2014) avec des yeux média-archéologiques: Comme dramaturgie, le film est une récit biographique traditionelle. Mais aux même temps, l'apparatus cinématographique reproduit des oeuvres de Turner qui sont *peint* avec couleurs materiaux sur un écran par projection de la lumière aussi sur un écran - l'écran de la cinéma. Un moment décisive dans le film est Turner qui regard une chemin de fer en passant, laissant des nuages de la fumée. Cet argument reste authentiquement plus vivant non-historiquement en reproduction cinématographique.

Mais dans ce contexte, rendrons l'opération archéologique à la France, mais non limité aux analyses de l'auteur Michel Foucault, plutôt au-délá: comme *média* archéologie.[43] Dans son interpretation des peintures de Edouard Manet[44], Michel Foucault sougligne l'écran plat, mais Foucault était aveugle pour les effets lumineuse de photographie qui étaient implicite ici: l'illumination eléctrique.

Média-archéologiquement, ils emergaient des nouvelles retrospectives sur l'histoire de la peinture par des opération photographiques, comme expliqué par Herman Grimm au fin de siècle dix-neufième pour les études academiques de l'historie de l'art. Le *Skioptikon*, un projeteur des diapositives des peintures historiques, rendrait possible une analyse des oeuvres en détail par agrandissement (le regard média-archéologique) et *comparée* comme condition d'un constallation formaliste de l'art, pas historiquement (limité à la contextualisation par les textes écrites).[45] Dans ce sens, André Malraux dèjà avait identifié un *musée imaginaire* par l'ordre médiatisée: la standardisation des oeuvres de l'art par la photographie noir et blanche.

Radical Media Archaeology and its complicated relation to the study of art history

Media Archaeology at first sight relates to technological media. Its task in relation to so-called contemporary "media arts" is to de-metaphorize its aesthetic gesture, separating truly technologically induced aesthetics from superficial effects.

But the more difficult question is this: Is there a relation between the study of works of art and Media Archaeology for times *before* technical media in the proper sense? Media archaeology is not simply an additional method to the

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[43] See W. E., M.edium F.oucault, Weimarer Vorlesungen über Archive, Archäologie, Monumente und Medien, Weimar (Verlag & Datenbank für Geisteswissenschaften, Reihe Medien, Bd. 4) 2000

[44] Michel Foucault, La Peinture de Manet [1971], in: Les Cahiers de la Tunisie, numéro spécial: Foucault en Tunisie, Tunis 1989, 61-87

[45] Herman Grimm, Die Umgestaltung der Universitätsvorlesungen über Neuere Kunstgeschichte durch die Anwendung des Skioptikons, in: ders., Beiträge zur Deutschen Culturgeschichte, Berlin (Wilhelm Hertz) 1897, 276-395

familiar art historical analysis by describing, for example, the impact of technologies like photography on painting, and by revealing its implicit technical impact on the aesthetic message.

So-called "art history" sprang from a certain discursive necessity in the past. "Historic" research means con*text*-intensive analysis, and the linear ordering of events - mostly achieved by historiographic narrative - since the end of 18th century served to reduce the experience of growing temporal complexity since the French and Industrial revolution (Reinhart Koselleck, Niklas Luhmann). But complexity nowadays can be coped with by mathematical modelling, by computational counting with probabilities in nonlinear ways.

There is "soft" media archaeology which takes care of "dead media" (Bruce Sterling) neglected in the history of culture and technology, which remembers "imaginary media" (Siegfried Zielinski) or which identifies patterns of technological recurrence ("topoi") *within* history of modernity (Erkki Huhtamo). Against the archaeological "digging" and "rediscovery" metaphor, radical media archaeology ("radical" in terms of the mathematical square root) identifies a non-historicist cut by technologies into so-called cultural history. Radical media archaeology has a sense of tempor(e)alities, but no sense of (art) "history".

Radical media archaeology - in its technically "grounded" version - takes its departure from technology in its proper sense. It concentrates on the epistemological insights which can be derived from the close analysis of electro-mechanical media, electronic media, and finally computative machines.

Technological media (photography) and the *beaux arts*

Cultural artefacts deserve to be differentiated from technological media. Sculpture and painting can *not* be considered as *technical* media. Painting is no technical medium in itself but can be related to technical media.

The direct relation of technologies to art history as research method started with the impact of technical means of reproduction of works of art (engraving, photography, the digital scan). That has become an issue of art historical research already. But a true *media archaeology* of art does *not* start with the obvious impact of photography on hand-related arts like sculpture and painting.

In Clement Greenberg's sense the flat surface of the painterly screen rather becomes the material "message" of the physical "medium". As has been pointed out by Greenberg in his writings on art, modernist painting itself has (re-)discovered the grounding materiality of the rectangular canvas as the principal message. McLuhan developed this insight into a media theory. The historicist idea of art historical moments itself is a photo-realistic effect.

Painting (art work) vs. photography (technical medium)

Ironically, it has been a painter, Henry Fox Talbot, who In 1844, in the introductory remarks to his publication *The Pencil of Nature*, emphasized that

the inserted photographic plates "[...] have been formed or depicted by optical and chemical means alone, and without the aid of any one acquainted with the art of drawing"[46]. By means of his invention of negative-to-positive kallotype photography) radically broke with the art historical and philosophical tradition and aesthetics of *mimesis*, iconological semantics and visual hermeneutics in his almost media-archaeolgical definition of photography: "The picture, divested of the ideas which accompany it, and considered only in its ultimate nature is but a succession, or variety of stronger lights thrown upon one part of the paper, and of deeper shadows on another."[47]

Media archaeology leaves it to media history to investigate the aesthetic impact of photography on human works of art and rather identifies the epistemological momentum deriving from within photography. "[A] painting, before it is a naked woman, a horse in battle, or an anecdote of some kind, is first a flat surface covered with colored marks assembled in a certain order."[48] John Ruskin defined the painting as "technique", operating on the difference between cognitive aesthetics and perceptual *aisthesis*: "We *see* nothing but flat colours; and it is only by a series of experiments that we find out that a stain of black or grey indicates the dark side of a solid substance, or that a faint hue indicates that the object in which it appears is far away. The whole technical power of painting depends on our recovery of what may be called the *innonence of the eye*."[49] But the human eye, in its cultural education, can never be innocent. To be suspended from iconology, humans may delegate visual analysis to the electric scanner and digital imager. The result is a new, media-archaeological way of looking at paintings from the past. According to McLuhan, "the stipple of points of Seurat is close to the present technique of sending pictures by telegraph, and close to the form of the TV image or mosaic made by the scanning finger" of the cathode ray tube. "All of these anticipate later electric forms because, like the digital computer with its mulitple yes-no dots and dashes, they caress the contour of every kind of being by the multiple touches of these points. Electricity offers a means of getting in touch with every facet of being at once, like the brain itself. Electricity is only incidentally visual and auditory; it is primarily tactile"[50] in terms of the electric stroke or impulse.[51] Thereby the world of the symbolic order is implemented in the electro-physical real word.

In defence of antiquarianism: Inbetween media archaelogy and history of art

What media archaeography shares with art history is *ekphrasis*, the analytic

[46] Henry Fox Talbot, The Pencil of Nature (London 1844; Reprint New York: DaCapo Press 1969) o. S.

[47] Henry Fox Talbot, The Pencil of Nature (London 1844; Reprint New York: DaCapo Press 1969) o. S.

[48] Maurice Denise, as quoted in Moles 1968 / 2011: 265

[49] John Ruskin, The Elements of Drawing [1857], in: ders.: The Works. Hg. von E. T. Cook / A. Wedderburn, Bd. 15. London (1904), 27

[50] McLuhan 1964: 247 f.

[51] See Heilmann 2010: 131

description of the essential details in cultural artefacts - be it a work of figurative art or a technological devices, both in terms of spatial co-existence of elements (as described in Lessing's *Laokoon* 1766), and in terms of their operative *being medium*. But in this affiity, the difference becomes apparent as well: digital aesthetics of counting by numbers rather than narrative. De-historicizing art history means de-coupling art remaining from the past from its narrative enframing, in favour of a rather diagrammatic, non-linear time graph to dis-cover different tempor(e)alities of works of art from the past. To the media-archaeological analysis, a "historic" piece of art is always radically present, both in its material and its techno-archival presence. Such an *antiquarian* attitude does not approximate a material artefact from the past to some discourse beyond it but treats it in its own, intrinsic terms.[52] The media-"antiquarian" (like the proper *archaeological*) method can be positively defined as both materiality and data-orientated - both in ascetic resistance to premature "historic" narrativization.

In the materialist emancipation of the object from being subjected to textual analysis alone, antiquarianism ackowledges the hardware from the past independent from historical discourse which provides the software operating upon such materialities. In a digital culture of apparent virtual realities the reminder of the resistance of material world is undispensable.

Physical and computational analysis vs. hermeneutics of art derived from the past

The analysis of the physical, material properties of a painting has been considered useless for the understanding of the meaning in art historical research (Panofsky[53]); this is what is aptly desscribed as "low level" properties in digital image processing as well: the internatl representation of images such as texture, shapes, hue, color distribution. So far this has been interesting for engineers only - which describes exactly the borderline between media-archaeological image analysis and iconological interpretation (visual hermeneutics). Once culture is not reduced to semantic meaning, algorithms which have been developed to analyze digitized works of art can reveal a different kind of aesthetics.

As expressed by Henry Fox Talbot in 1844, the photographic instrument is a true media archaeologist because it is suspended from the cultural semantics of art historical value. It "chronicles whatever it sees, and certainly would delineate a chimney-pot or a chimney-sweeper with the same impartiality as it would the Apollo of Belvedere."[54] In his publication *The Pencil of Nature* (referring to plate III „Articles of China"), Talbot already had pointed out the non-human *archival* efficiency of the photographic shot, its automatic register: "The whole cabinet of a Virtuoso and collector of old China might be depicted

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[52]   Stephen Bann, Clio in part: on antiquarianism and the historical fragment, in: Perspecta. The Yale Architectural Journal 23 (1987), New York (Rizzoli), 24-27 (27)

[53] See Erwin Panofsky, Meaning of the Visual Arts, Chicago, Il. (University of Chicago Press) 1955, 14

[54]   Ibid., Text zu Tafel II „View of the Boulevards at Paris"

on paper in little more time than it would take him to make a written inventory describing it in the usual way. The more strange and fantastic the forms of his old teapots, the more advantage in having their pictures given instead of their descriptions."[55]

Wölfflin's formal language: Suspending "past" art from historical discourse

When inaugurating media analysis not only as sociological practice but as true theoretical discourse, Marshall McLuhan was not only familiar with *Art and Illusion* by Ernst Gombrich (Princeton 1960). McLuhan's media theory was even more direclty and explicitly inspired by cubism as an artistic practice in early 20th century which deconstructed the perspective 3-D illusion of flat paintings in favor of revealing its symbolical construction.

Inspired by artistic practice in modernism, media-theoretical analysis focuses on the message of the medium itself. Applied to memory agencies and especially the ‚digital archive', this method demands not only a close analysis of its different technology but a new interpretation of its different epistemological and aesthetical dimension as well. While the traditional archival format (spatial order, classification) will in many ways necessarily persist, the new archive is radically temporalized, ephemeral, multisensual, corresponding with a dynamic user culture which is less concerned with records for eternity but with order by fluctuation. New kinds of search engines will not only answer the needs of media arts but develop into a new 'art of the archive' itself. Already Heinrich Wölfflin in his *Kunstgeschichtliche Grundbegriffe* in 1915 proposed a comparative analysis of basic forms in works of art instead of focusing on their iconological content, such as: linear vs. picturesque, or closed vs. open form. Wölfflin reconructed the set of forms which were available for arists in his epoque - *l'archive* in Foucault's sense.[56]

Information theory has offered a non-cultural explanation of aesthetic value. But can it be called "art" at all when not considered in terms of cultural meaning? The media-archaeological operation here distances art from history (for a moment) with the help of optical and image-processing technologies.

The media-archaeological procedure is dialectic. It suspends art of the past from its historiographical enframing, and then re-discuss it in terms of the elaborate *sciences* humaines (which is *both* philosophical techno-epistemology *and* computational science).

Media archaeology is not concerned with the *historical* past but with present re-enactions. Its analytic target is not simply the impact of technologies on human culture (individually and collectively), but it radically derives insight and knowledge from the instrinsic properties of the technical and/or logical artefact directly.

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[55] In: Wolfgang Kemp (ed.), Theorie der Fotografie: eine Anthologie, Bd. 1, München (Schirmer / Mosel) 1980, 60-63 (61)

[56] Heinrich Wölfflin, Kunstgeschichtliche Grundbegriffe. Das Problem der Stilentwicklung in der Neueren Kunst [*1915], Basel (18. Aufl.) 1991, 5

Computational archaeology of art historical works

The first *technical* revolution of art history as academic practice (if not even its condition) has been the photographic reproduction of works of art (kept in Photothèques); the second is its transformation by computational science ("Informatik").[57]

Research into technologies as generative agencies of aesthetic forms (like the impact of the camera obscura, of photography, film, video and the computer on painting) belongs to the field of media history (since it reconstructs historical interrelations between the technological *dispositif* and culture), while the *mathematization* of the image in the Renaissance belongs to active media archaeology since it allows for a non-historicist analysis of such images, *culculating* its geometrical dimensions (as has been pioneered in the "Piero Project" for virtual navigation through the painting).

Recently, scholars like Horst Bredekamp have started to actively include the "technical image" into art history, such as Leonardo's engineering drawings and scientific diagrams.[58] Guerino Mazzola has been inspired by Raffael's painting *School of Athens* not as a *connoisseur* of art but explicitely as mathematician ("als Mathematiker"). Listening to a lecture by the art historian Oskar Bätschmann on the hidden symmetries in this work of art made Mazzola envision to reveal such hidden spatial relations in a Renaissance painting applying methods of modern computational modelling, virtually tracing variances in the perspectival construction.[59] This is truly media-archaeological dis-covery of art-"historical" *implicit* knowledge in both senses: a) the methodological approach (Mazzola) and b) its non-human operation (*active* media archaeology by the computer).

On the other hand, this means: the digital image is always already an archival one; pixelwise it exists in virtual, that is: calculabe space only in an archival mode, like the score in music. With this transsubstantiation the art work is subject to techno-mathematical control - in the micropolitical and the epistemological sense. This makes all the difference between the painterly stroke or even *pointilisme* and bit-mapped graphics.

To search the images themselves in a transitive way is the option provided by the video compression codec MPEG-7 which "promises the ability to tag the image itself. But all these are still text-based. 'We have to write out a description for, or appended to, the image and then search for it by entering

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[57] See the preface by Oskar Bätschmann, in: Guerino Mazzola / D. Krömker / G. R. Hofmann, Rasterbild - Bildratster. Anwendung der Graphischen Datenverarbeitung zur geometrischen Analyse eines Meisterwerks der Renaissance, Raffaels „Schule von Athen", Berlin u. a. (Springer) 1987, IX-XII (IX)

[58] See the entries "Medientheorie: Bilder als Techniken" and "Kunstgeschichte" in: Bild. Ein interdiszplinäres Handbuch, ed. Stephan Günzel / Dieter Mersch, xxx

[59] Preface Guerino Mazzola, in: same author et al. 1987: XIII

the keyword."[60] Color, composition and other image features can be directly tagged to the image - even if this is still metadata, an index, automatically or human-based. But this *textualization* of the image allows for its non-linear diagrammatic ordering. This allows - not only in film studies - for similarity-based search for images "by example", especially in big image banks like André Malraux' *musée imaginaire* - reversed, "analytic" kinematographics. Techno-mathematical intelligence is "hardware and software that turned the moving image into binary code, and once so encoded, almost anything could be done with it"[61]. After Kasimir Malewitsch's *Black Square* had defined the ideal grey value of painting, Wassily Kandinsky in 1912 pointed it out: "The final abstract expression of every art is a number."[62]

In the mathematical epistemology of media archaeology, there are almost timeless structures of aesthetics at work which defy the evolutionary concept of art history. There have been numerous attempts to characterize artistic creation as a set of rules such as the Pythagorean Golden Section; in the Renaissance, artists like Alberti and Dürer formalized rules for projective geometry. "Until recently, rules of this type could be expressed only in the form of narrative writing in the native tongue of the author. With the advent of the computer, it became possible to characterize these rules formally to a computer. <...> Noll´s simulation of paintings by Mondrian is one of the arliest examples of describing an artistic style as an algorithm."[63]

Optical configurations have existed as *images* sor far only when being in communication with the human beholder who privides the iconological sense. But what happens when an art historical image is not seen by a human but by a machine? Before the massively recursive algorithms of "Deep Learning", it required a human intervention to teach art historical value to computational images; therefore a guiding principle used in image processing is "to let the user do what the system cannot achieve by itself (e.g. the characterisation of a semantic concept)"[64].

The "cold" media-archaeological gaze: Pixel analysis

In an interview at Berkeley University, Foucault once answered to a student question whether archaeology is a new method or simply a metaphor. The English versions reads like this: "We <...> have the word `la arché' in French. The French word signifies the way in which discursive events have been

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[60] Robert Kolker, Digital Media and the Analysis of film, in: Schreibman et al. (eds) 2004, 383-396 (395)
[61] Kolker 2004: 388
[62] Quoted here after: Raymond Guido Lauzzana / Lynn Pocock-Williams, A Rule System for Analysis in the Visual Arts, in: Leonardo 21, No. 4 (1988), 445-452 (445)
[63] Lauzzana / Pocock-Williams 1988: 445
[64] S. Marchand-Maillet, N. Lasri, H. Müller, W. Müller u.T. Pun, The Reality of Automated Content-Based Image Retrieval Systems, in: W. E. / Stefan Heidenreich / Ute Holl (eds.), Suchbilder. Visuelle Kultur zwischen Algorithmen und Archiven, Berlin (Kulturverlag Kadmos) 2003; see further http://viper.unige.ch

registrated and can be extracted from the archive. So archaeology refers to the kind of research which tries to dig out discursive events as if they were registered in an arché."[65] From a computational point of view, this is not an archival metaphor, but what the micro-processor does in visual processing is in fact assigning the image its storage locations and prodiving them with addresses. The media-archeologists of art works (whether "historical" or contemporary") studies the *non*-discursive conditions of an emergent discursive ("art historical") formation.

It is not the high resolution of image quality which is the crucial character of its digitized reproduction (or rather: transformation) but its addressability at every discrete pixel element. This is a non-social approach, since it ignores the discursive implications and the painter's intention. Here, what is called Digital Humanities, turns out algorithmically "inhuman" (but in the best sense of Jean-Francois Lyotard's essay under that name). Face recognition identifies schemes, not individuals - but this happened with the painterly perspective in the Renaissance already which subjected the painter's subjectivity to the geometrical construction (Dürer's *Underweysung der Meßkunst*). For the first time, the memory of art from the past is - once translated into the computer - computable, allowing for algorithmic analaysis such as *pattern recognition* - in large amounts unreachable for the single human mind.

An artistic answer to academic media archaeology's *distancing algorithmic* approach to art history is artistic media archaeology itself. Media archaeological art derives sparks of insight and knowledge from close analysis of technology by aesthetic means (with installations as arguments), complementary to discursive academic argumentation (media theory). These are two branches emanating from one epistemological object (the "Y" model).

Truly media-archaeological art demonstrations have been Douglas Gordon's museum film installation *24 hours "Psycho"* or Angela Bulloch's dissolving single film frames into monumental three-dimensional pixel blocks. What is both epistemologically and aesthetically attractive in dissolving a historical pinting into its raw pixel fields is its formal, not hermeneutic analysis; the cybernetic fascination of discovering governing rules which escape the traditional author's intentionality is discourse analysis in the best Foucauldean "archaeological" sense.

In a rigorous materialist interpretation of Immanuel Kant's notion of *a priori* and Michel Foucault's *Archéologie du Savoir*, media archaeology "looks" at the image on the level of its techno-mathematical existence - be it the geometrical construction rule of Renaissance perspective, or the neighborhood of pixels in a digitally sampled and subsequently algorithmically manipulated painting such as Gustav Klimt's *Freundinnen* (one of the masterpieces of the Vienna secessionists) by Georgian artist Tea Nili: *Freundinnen (Gustav Klimt Series)*, 2014.[66] While humans, when looking at this image at a distance, are still

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[65] Document D 152 (Centre Michel Foucault): "Dialogue on Power. Michel Foucault and a group of students", in: Quid, Los Angeles: Simeon Wade ed., 1976, 4-22 (Circabook), 10

[66] From: Catalogue Tea Nili. Selected Work 2012-2014, edited by Lily Fürstenow-Khositashvili, Berlin

trapped by the iconic *Gestalt*, the digital ground gets evident only in further resolution at close distance. For the "eyes" of the machine, there is no difference between a matrix of distributed color values and *Gestalt*, for human phenomenology only a figure emerges (unless the computer is neuro-informationally trained as "Perceptron" to recognize shapes such as in OCR, which has been practiced in classic cybernetic "informational aesthetics" by Moles, Steinbuch, Bense, and as "Deep Learning" in the hyper-computational present.

When compared with its "original", this is media-archaeological image analytics indeed. "This unusal reduction technique reveals the pixel grids - the underlying structure of each digitally photographed image"[67] - a media-active reduction of visual iconology to its inherent logics, to its *arché*. A photographic print of a pixel, though, is no indexical digital picture element any more, since it has lost contact with the integrated circuitry of voltage derived from optical signals - cut off from digital control.

Nili's algorithmic, CCD chip-based pixelization of "analogue" paintings comes close to experiments in Digital Humanities laboratories which count with the nonhuman gaze of digital image processing not as substitution but augmentation of traditional humanist (art historical) image analysis. "There's a significant difference between the way our brain perceives colour spectrums as compared to the way digital photography and computer software processes colour" (Fürstenow-Khositashvili).

There is an uncertainty equation at work, known to quantum physics as well as to cognitive psychology: We see either figure or ground. The closer we recognize the slight chromoatic modulations by close pixel analysis, "the contours dissolve in abstractions with vague outlines" (Fürstenow-Khositashvili). By reducing a painting such as Klimt's *Freundinnen* to its dominant colour pixels which are green-blue and reddish-orange, Nili reveals the painter's colour palette. According to Martin Heidegger, with spectography as scientific analysis of light into wave lenghts the colour itself disappears. The closer we look at the image in media-archaeological ways, the more its cultural semantic is lost, while - the other way round - iconological analysis of art historical works misses their "mediality".

The pixel manipulation is a personal interpretaion, a subjective appropriation of the original work of art - in the best tradition of print, copper and lithographic engravings as individual "critique" of the original, "printmaking as metaphor for translation" in terms of Ségolène Le Men.[68]

At the same time, the radical pixelisation is a reminder of the "blind spot" in most art-historical presentation of images from beamers in lectures: this is not the real thing.

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[67] Curator Lily Fürstenow-Khositashvili, Erasure. Afterword to the catalogue: Tea Nili. Selected Work 2012-2014, Berlin

[68]   See Ségolène Le Men, Printmaking as metaphor for translation: Philippe Burty and the *Gazette des Beaux-Arts* in the Second Empire, 88-108, in: Michael Orwicz (Hg.), Art Criticism and its Institutions, Manchester (UP) 1994, 88-108

But which is the original work of art? The traditional answer of course is to refer and return to the original work of art - which is difficult unless one visits the actual museum where it hangs at the wall.

That is why Johann Joachim Winckelmann once turned from Nöthnitz to Rome: Not being critically content with (excellent) copper engravings of ancient sculpture, he wanted to investigate the original materiality "forensically" - the archaeological gaze as such.

Back to the painting itself: How is Gustav Klimt's *Die Freundinnen* (1916) usually represented for analysis? Photographies and slide projections in art historical argumentation still had an indexical relation to the physical painting. But its digital scan is not just another "technical reproducibility" in Walter Benjamin's sense, but a complete transsubstantiation of its epistemological essence: its informatisation, which makes it accessible for the most intelligent mathematical operations on the one hand, and exhaustive manipulation on the other.[69]

There is no metaphysical" but strictly technological moment(um) in the analog-to-digital conversion of material artistic images inherited from the past.

[En moment du *sampling* (et quantisation / numéritasiation) de l'oeuvre, parallel au regard humain sur l'art de passé, un autre "regard" non-humain (même un resultat culturel) a lieu.]

With digitization (the sample-and-hold mechanism), a dramatic metamorphosis takes place where hand-made art is transformed into computability. This is not just a further version of the optical camera / art work constellation, but an epistemological *transsubstantiation*. Digitalization can only be a filter of the material work of art, not the indefinite variability of the physical surface (or even essence) - even not by "oversampling". Therefore computational theory nowadays strives for "physical modelling", reconstruction the object from its material basis, its physical "grains" - like the surface of a marble sculpture.

The oblivion of the algorithmic transformation of an art historical image into a mathematical function, from the point of view of media archaeology, is one of the most fundamental sins of art historical presentations. Who should be critical of the nature of the digital image in present culture if not the science of art history? What what if art history itself ignores here to reflect its own academic practice?

Therefore *attention*, what is projected from a beamer or as from recall in the Internet, is not the Klimt original in its own materiality, but rather its digital simulacrum.[70]

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[69] For such reflections on the changing nature of the photographic image, see Jacques Derrida and Bernard Stiegler, Echographies of Television, Cambridge (Polity) 2002
[70] See Jean Baudrillard, Pourqoui tout n'a-t-il pas déjà disparu?, Paris (Les Éditions de l'Herne) 2007

In juxtaposing Gustav Klimt's *Freundinnen* with Tea Nili's pixelized interpretation on the computer screen, what actually is compared is a digital image with a digital image. Not Klimt's painting has been manipulated but its "binary photography", its informational reproduction, its "technical image" in Terms of Vilém Flusser.[71] According to his media philosophy, the alpha-numeric codification of an image is iconoclasm, and at the same time accepting the language of digital economy. The binary "textualization" of a painting transforms it into a formal language which returns with the QR Code (a Barcode) which becomes "readable" by downloading a software scanner, commercially called very appropriately an "Imager", as an "App" on private iPads, iPhones, iPods or an Android Smartphone.

Images can therefore be "read" (deciphered" as texts (character strings), whereas *vice versa* conventional alphabetic texts can be transformed into statistical diagrams which look like images. Thereby a whole printed edition of Immanuel Kant's *Kritik der Urteilskraft* can be compressed into a statistical graph - but this is an image no more but a diagram.[72]

The mapping of an image from the external world onto the memory of a digital camera *via* CCD sampling is already a translation of the physical world into an information which does not even fulfil the criterium of an archival document in its jpg format which is lossy compression. "As a result of radical image decomposition pixels and pixel groups arranged into chromatic colour orders emerge" (Fürstenow-Khositashvii).

The crucial question in digital analytics of cultural images is this: Does such an analysis reveal art historical meaning or rather the message of the machines itself? "The sets of patterns otained by means of gradual eraseure procedure", even if manipulated by the artist Nili by means of Photoshop software, "belong to the order of the machine. It's perception of colour is hypnotic yet dehumanised". "The rhythm of patterns in Nili's photographs <...>, the possibility of colour variations is strictly delimited by the software program" (Fürstenow-Khositashvili) which - in the precise sense of Foucault's definition of *l'archive* - governs what can be expressed and perceived. All would be different if the artist became a painter again, "painter" in a second order observation: programming the algorithm herself.

A picture which is computationally interpreted as an arbitrary, cultural, neg-entropic configuration of picture elements (or painterly strokes) can be set in motion by a color similarity sorting algorithm which step by step deconstructs its iconological meaning towards a histogram.

[A flash animation on the *Searching Images* project homepage expresses its research assumption by algorithmic means: *online*: www.suchbilder.de]

Such is the "surgical" gaze described by Walter Benjamin for the age of photography and film - a "cold gaze" which fascinated Ernst Jünger in his

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[71] Vilém Flusser, Die Auswanderung der Zahlen aus dem alphanumerischen Code, in: Dirk Matejowski / Friedrich Kittler (Hg.), Ende der Schriftkultur, xxx

[72] See Axel Roch, Texte als Bilder lesen, in: online journal *Verstärker*, xxx

description of the painless body. But what makes it so attractive for the contemporary artists to elementarize and to alter an image by reducing it to the pixel level is not simply any visual artefact but the fact that it is the digital version (the information) of an art historical painting: "Citations from art history - the history of painting and film are essential in Tea Nili's oeuvre" (Fürstenow-Khositashvili). Is it cultural semantics which inspires the techno-archaeological museum?

Visual analytics: Warburg vs. Manovich

With so-called digital culture, the alphabetic memory returns again - but this time from within the alphanumeric code which is invisible to most human users of such technologies. All of the sudden, on a few Compact Discs, the whole collection of an art museum could be addressed. Such digital sampling transforms the cultural and ethic essence of such a memory, and which are the mnemo-*generative* capacities of recorded data? By analog-to-digital conversion, the representations of art historical works can be stored on digital media not only for archival preservation or televisual broadcasting but in addition for *processing*; this allows the coupling of such cultual-aesthetic memory to mathematical intelligence.

Art historical *ekphrasis* has so far been logocentristic. But there is a computational alternative to adressing images by words which is creating content-based descriptions from a digital image file itself: "The content-based work most notable for arts and humanities focuses on the recognition and descripton of color, texture, shape, spatial location, regions of interest, facial characteristics, and specifically for motion materials, key frames and scene change detection. One goal of content-based work is to provide algorithms that can automatically recognize the important features contained in an image without human intervention in the process."[73] This does not impoverish but enrich the world of artistic research and brings us to the research tools of so-called Digital Humanities, its limits and transgressions when compared with traditional studies of images.

A non-historical approach to art works from the cultural past by mapping its photographic reproductions has been performed by André Malraux' *musée imaginaire* and Aby Warburg's noteworthy *Mnemosyne Atlas*. Warburg's method of tracing the tentatively "unconscious" cultural memory of visual gestures (derived from antiquity and re-activated in the Italian Renaissance) itself was performed on a technical medium basis, which is: black & white photographies of works of art which could be associatively arranged and re-configured on a black board at Warburg's Kulturwissenschaftliches Institut in Hamburg. Whereas the scholarly print publication of Warburg's *Mnemosyne Atlas* inevitable freezes such dynamic reconfigurations in momentary snapshots, its digital publication at least allows for dynamic access to the single elements of such visual tables and their reconfiguration. Probably the cultural *unconscious* memorizes images like a visual search machines indeed, whereas art history is

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[73] Donna M. Roman, Image and Multimedia Retrieval, Diskussionspapier des Getty Information Institute (vormals The Getty Art History Information Program), last revised: 1995-09-26

the academic skill of identifying the iconological and semantic vectors in their thick cultural context. This can not be performed by a machine which can only operate with exact data. Turing machines in their strict syntax and therefore Artificial Intelligence necessarily miss the cultural semantic ambivalences.

This is by no means a deficiency to be eliminated by "cognitive" or "neuronal" computing, but rather an alternative to be cultivated to enrich the notion of cultural memory by non-human points of view.

Experiments with the art historical archive: Histogrammatology

Experimental archives differ from the well-organized institutional art historical image repositories. Electronically sampled analog images can be digiallty quantized and thereby transformed into a vast data set, to make them assessible to truly image-based search operations such as matching of similarities, object feature detection, statistical colour value comparision, entropy. Lev Manovich develops this approach in his essay "How to Compare One Million Images?"[74]

In an effort to achieve non-iconologic analysis of images, the *Active Archive* project of the Brussels based artistic research group Constant applied algorithmic processing of digital scans of the huge photographic archive of the Norwegean avantgarde author Ansgar Jorn. "These digital images are made of pixels rich in color informations, but how can one 'order' by color? What is a significant color information? Contrarily to human intuition, for a computer, a white image is an image saturated with red, blue and green. [...] Ordering is then not only following the raw values coming from the digital objects but already transforming them in dialog with a certain understanding of human perception."[75]

Towards a new notion of "art" inherited from the past, the algorithmic analysis of paintings identifies a non-ocular aesthetic essence of images which can only be *art*iculated by computational, that is: informational means.

Looking at images the way a scanner does, results in a new art of the archive indeed: the experimentation with histograms for exploring the digital photo-archive. An image histogram is a media-archaeological, non-iconic way of looking at one and the same photographic picture. This tool is well know from current digital cameras where photographer *a priori* use them as an aid to show the distribution of tones captured. A histogram "acts as a graphical representation of the tonal distribution in a digital image. It plots the number of pixels for each tonal value."[76] By looking at the histogram for a cluster of images a viewer will be able to judge the entire tonal distribution at a glance" - a truly analytic form of *visualizing images*, revealing their immanent, implicit

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[74] In: Understanding Digital Humanities, edited by David M. Berry, Basingstoke (Palgrave Macmillan) 2012, 249–278

[75] http://guttormsgaard.activearchives.org, "eleven orderings: guttorm guttormsgaard"

[76] http://sissv.activearchives.org/w/Histograms_in_the_distance (accessed January 5, 2015)

iconicity.

With the current digitalization of most concentional image collections, the temptation is there "[...] to replicate already known models like a database with standard field descriptors and an interface for public consultation mimicking the photo album."[77]

But the alternative media-archaeological approach takes the digital scan at its face value. Since the digitization of an image is not only a practical conversion from one format to another, "the digitization changes the ontology of the archive itself. [...]. The DNA of a digital image is a matrix of pixels that can be manipulated mathematically and allows for a very different set of operations"[78] when compared to the traditional iconological art historical approach.

Informational aesthetics: Entropy instead of (art) history

Media archaeology, when confronted with artistic works from the past, does not historicize them but rather approaches them in terms of computational aesthetics, as developed by Abraham Moles[79] and Max Bense from information theory. Bense in his effort to reach "exact aesthetics" identifed the *aesthetic state* as the "energy" of an artistic object, resulting from the mathematically contrary components order and complexity as previously defined by Birkhoff.[80] According to Birkhoff, the "aesthetic measure" (M) equals the ratio of order (O) / complexity (C), oscillating around the borderline between O and C.[81] The less a work of art is redundant (responding to the already known), the more it is *informative* in the engineering sense as developed by Claude Shannon's in "A mathematical theory of communication" (1948). Therefore "entropy" as a measure in works of art is a category born from information engineering.

The art historian Rudolf Arnheim, in *Entropy and Art. An Essay on Disorder and Order*, once demonstrated what an entropic measure of a baroque painting looks like.[82] For Arnheim, though, this was meant as a critique of the transfer of notions of information theory into the field of art, criticizing that the overall concept of entropy as temporal vector ignores the art historically derived structure of form and suggests that we must (re-)turn our gaze to the

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[77] http://sissv.activearchives.org/w/Welcome_to_the_Digital_Darkroom (Abruf 11. Dezember 2014)

[78] http://sissv.activearchives.org/w/Welcome_to_the_Digital_Darkroom (Abruf 11. Dezember 2014)

[79] See A. Moles, Information Theory and Aesthetic perception, Urbana, Ill., 1966

[80] Max Bense, Ästhetik und Programmierung, in: Bilder Digital. Computerkünstler in Deutschland 1986, ed. Alex and Barbara Kempkens, Munich (Barke) 1986, 22-30 (22). See Fig. *Das physikalische Unordnungsschema im Verhältnis zum ästhetischen Ordnungsschema*, in: Bense 1986: 29

[81] G. D. Birkhoff, A Mathematical Approach to Aesthetics, in: Scientia, September 1931, 133-146

[82] From: Entropie und Kunst: Ein Versuch über Unordnung und Ordnung, Köln 1979

"preserved islands of order everywhere"[83] - which chaos theory (Iliya Prigogine) would call *strange attractors*.

As extreme examples "of what he saw as entropy gone mad", Arnheim referred to minimalism, experimental music and avant-garde film[84] - which is exactly where art history ends and contemporary art begins. Truly media-archaeological de-historization results in the intellectualization of art from the past - in the sense of computational *intelligence* (information theory), replacing stylistic interpretation by, e. g., signal-to-noise ratios and entropy values.

Technical image reproduction and entropy: A xerographic *mise-en-abîme* of art historical paintings

Economical display of paintings according to their formats has not only been a practical concern in Baroque collections of painting but has become the subject of paintings itself, in gallery images as literal *imaginary museums* as painted by Panini, Téniers, or Frans Francken II. When a photographic reproduction of such a painting is subject to xerographical miniaturization which then in return is being magnified again, it is subject to gradual entropization:

Fig.: "Umzeichnung des Gemäldes 'Der Bildersaal' von Frans Francken II. Ausschnitte aus dem Prozeß einer fünffachen Verkleinerung und anschließender fünffacher Vergrößerung. Konzept: Ulrich Giersch"[85]

Entropy thereby becomes the "aesthetic measure" (Max Bense) of a display of such items. The *informational* value is what media archaeology detects in image representations, decisively different from cultural or art historical analysis.

Whereas the machine has no criterium at what point a picture is not a picture any more but a shere random distribution of grey or color versions (the media-archaeological perspective), only to humans there is a threshold of figurative sens. Emmett William has experimented with the cognitive borderline between what can still be perceived as a meaningful image and an informal electro-static xerographical distortion; the American artist Ian Burn 1968 proved that even an empty page, re-xeroxed a couple of time, generates entropic distribution of graphical traces.

What do such operations add to a contextual knowledge of Frans Francken's

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[83] Rudolf Arnheim, Entropy and Art. An Essay on Disorder and Order, Berkeley / Los Angeles / London (Univ. of California Pr.) 1971, as quoted in: Susan Ballard, Entropy and Digital Installation, in: Fibreculture Journal 7 (2005); *online* http://journal.fibreculture.org/issue7/issue7_ballard.html (Zugriff November 2007)

[84] Ballard ibid.

[85] From: Ulrich Giersch, Zettels Traum. Fotokopie und vervielfältigte Kultur, in: Harry Pross / Claus-Dieter Rath (eds), Rituale der Massenkommunikation. Gänge durch den Medienalltag, Berlin 1983, 59 f

musée imaginaire? To photo-electric organs which "look" at such museum pieces from outside historical discourse, it allows to focus attention to elementary shape distribution - dehistoricizing art history.

Sorting images according to formats: The old and the new museum wall

Nowadays it is the computer which, by digital sampling, deciphers images as data-sets. When visual content of museums - once it hat been digitized like in Picture Disk editions of art historical works - becomes alpha-numerically addressable, new options of mobilizing the inherent information by intelligent algorithms is possible. In fact the storage of picture content in computer memory and with algorithmic sorting rather adopts the "St. Petersburg hanging" according to spatially distributed economy of formats and image compression rather than according to subjects or as time-ordered unfolding.

Digitally interfacing the museum from within: *Metasyn* and new options of sorting images in space

What happens if the user-friendly virtual interfaces which museums have created for the Internet public re-turns (into) the museum space itself? The Museum of Contemporary Art in Roskilde (Denmark) has experimented with *Metasyn* for example, "an interactive visualization that gives visitors an insight into the collection <...>. The content of the visualization is based on the museum's database and the analogue video and sound sequences that have been digitzed to date. The physical interface constists of a six-meter-wide, slightly concave screen and a handheld poiting device that rests on a cylindrical mount. On the screen, more than 1,000 physical objects from the ocllection and more than 2,000 digitized sequences originating from those objects are represented as icons in three-dimensional space. Using the pointing device, visitors can look around and nagivate quickly through the collection."[86]

"At the Macro level, the entire collection is presented in a diagram where a single selected object is put into the context of the whole. A horizontal timeline, spanning approximately a century, divides the digitized sequences in the upper hal from the physical objects in the lower" <91>. "It's possible to fly back or forth in time to hear and see how the ideas, styles, and use of technologies gradually change in the art works. <...> the naviation clearly reveals time-based delvelopment in the museum's various and changing areas of interest" <93>.

Art history and the (new) museum

The chronological hanging of pictures and placing of monuments in cultural museums, such as past 1800 in the Alten Museum in Berlin, has been

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[86] Carl Emil Carlsen, Metasyn, in: Re.Action. The Digital Archive Experience, hg. v. Morten Sondergaard, Aalborg (Aalborg UP) 2009, 89-97 (89)

philosophically anticipated in the final passages of Hegel's *Phenomenology of Mind*.[87] This order is being de-constructed by the recombinant computing power of the virtual, that is: algorithm-based museum, resulting in a kind of dynamic, never-final archive: "Digital archiving could break up the alliance that the museum has maintainted with history or even historicism since 1800. 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."[88] Digital archives provide the museum with "combinatory power"[89].

The Media Lab at the Rijksmuseum Amsterdam has developed the Web Portal *Rijksstudio* to become one's own virtual curator[90]; and the Tate Britain in London has initiated the *Tate Collective*, a room in the center of the gallery as experimental space for virtual sorting of images, experimenting with other forms of picture display on the museum walls. The St. Petersburg hang for example connects closer to the visual experience in current Web 2.0 photo and video microblogging platforms like www.tumblr.com or YouTube.

The Virtual Curator which as software from the Rediffusion Simulation Research Centre at the University of Brighton is an authoring environment which enables the user not just to walk at random but to work within the metaphor of the museum. "The user has access to a museum store of objects that are unclassified. They are able to classify the objects and sort them into groups. <...> The software <...> offers the user an active role."[91]

Andy Warhol once proclaimed: The best museum is a department store.[92] What is known in economy as "chaotic shelfing" for storing objects in magazins, corresponds with dynamic storage in Random Access Memories within computers. So let us media-archaeologically cultivate the informative dis-ordering of art history.

"ON NATURE" AND THE UN-NATURAL. Re-visiting the *Wunderkammer* with media-archaeological eyes & ears

"Wunderkammer"

In the visual aesthetics of user-generated Internet communication (the so-called social media), the almost anarchival disorder of the Baroque curiosity

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[87] Friedrich Kittler, Museums on the Digital Frontier, in: Thomas Keenan (Hg.), The End(s) of the Museum, Barcelona (Fondació Antoni Tápies) 1996, 67-80 (68)
[88] Kittler 1996: 75
[89] Kittler 1996: 74
[90] https://www.rijksmuseum.nl/en/rijksstudio
[91] See Colin Beardon and Suzette Worden, The Virtual Curator: multimedia technologies and the roles of museums; paper published in: E. Barrett & M.Redmond (eds.) Culture, Technology, Interpretation: the Challenge of Multimedia, MIT Press, Camb, Mass. 1995
[92] As quoted beforehand in the thematic issue "Leegte / Emptiness", in: Mediamatic 3#4 (Juli 1989), 195

cabinet (*Wunderkammer*) with its unique combination of work of art, works of technology and natural artifacts seems to return. This is not simply a superficial nostalgia for a non-classificatory, rather similarity-based "order of things" as practiced in Renaissance and Barocke times (Foucault), but this recursion indicates a deep-structural affinity between the Wunderkammer and the dynamics of the Internet. This might be positively interpreted as a symptom of a new techno-museological aesthetics: the "algo-rhythmicized" Wunderkammer. But first of all it takes a critical approach to the apparent "return" of the Wunderkammer in Internet times. How such a formation which had been completely displaced can turn up again massively? Traditional evolutionary models of cultural history fail here and ask for new figures of *iterative time*.

While the idea of the Wunderkammer had been forgotten in enlightened musological modernity, to the generation of social media users it becomes interesting again because the miscellania the curiosity cabinets used to display in the Renaissance and Baroque period, as well as the way these heterogeneous items were displayed seems not unlike the manner in which digital archives and the Web are being organized - or dis-organized - today (Heloisa Amaral).

A critical approach to the "return" of the Wunderkammer

So what is the present nostalgia for the Wunderkammer a symptom for? It is the fascination of the Wunderkammer with "artificial nature" such as automata? In the curiosity cabinet, there was no ontological dichotomy between technique and "nature". The same is true again for digital culture when nature itself becomes virtual physics like in computer games: a simulacrum or even emulation. Only with the conceptualization of art *history* since late 18th century, works of art have been separated from machines as technical masterpieces in favor of aesthetics.[93]

The apparent disorder of the Wunderkammer in Baroque times was perceived as a hidden order of creation whose secret ratio was known to God the creator exclusively. The "digital Wunderkammer", on the contrary, exists without such theological background; image clusters are organized by algorithms which are known to the human programmer and have been "embodied" (computatinally implemented) in machine operations. Thereby, the creative potential of the new Wunderkammer in the Internet era carries within also a risk: "the danger of 'endless freedom', of never having to formalize knowledge"[94].

The museological fascination regarding the Baroque Wunderkammer today is two-fold: there is the anti-taxonomy of similarity-based order; and then there is its remarkable respect for the un-natural in nature and the artificial in terms of technology.

In the Wunderkammer, *naturalia*, *artefacta* as products of human culture, and *scientifica* (devices of human mastering of nature, such as astrolabes, clocks,

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[93] See Bredekamp 1993: 33, and 88
[94] E-mail Heloisa Amaral, April 24, 2015

automata, and scientific instruments"[95]) met in incompatible ways: "Resemblance was central to the baroque delight in paradox."[96] But such union of "incompatible distancess" (as once expressed by Thomas Browne) nowadays is calculated mathematically. "To think in the presence of a cryptic *Wunderkammer* <...> required a calculus of combinations for inferring the connections among thousands of unknown aspects"[97], like the algebraic generation of new concepts in Leibniz's epitemology. It is this mathematically sublime aesthetics which Gilles Deleuze re-discovered in Leibniz in his book *The Fold*.

How to cope with strange natural forms like the Nautilus shape? The relation between the ancient Wunderkammer and infinitesimal mathematics and logarithmic analysis is deeper than it is apparent at first glance - just like contemporary compositions like Johann Sebastian Bach's fugures with the "general bass" base represent a musical equivalent to the infinitesimal calculus.[98] Leibniz is not just a contemporary of the European *Wunderkammer* but its radical fulfilment and transformator. His differential calculus mathematized the wonders of God's creation, replacing the juxtaposition of forms by algebraic formulas: "Mit dem Kalkül war ein Weg gebahnt, dem 'unendlichen Autor' Gott in seine Physik hinein zu folgen."[99]

René Descartes and Gottfried Wilhelm Leibniz once radically broke with the *Wunderkammer* epistmology of similarities in natural and cultural objects; they replaced both the *ars memoriae* and the collection of curiosities by calculating with numbers. Descartes criticized the traditional category of resemblance as fundamental experience and primary form of knowledge, "denouncing it as a confused mixture that must be analyse in terms of identity, difference, measurement, and order. <...> Indeed, it is by means of comparison that we discover `form, extent, movement and other such things´ <...>. The comparison of the sizes of two multiplicities requires <...> that they both be analysed according to a common unit <...>. Measurement enables us to analyse like things according to the calculable form of identity and difference."[100]

But even Leibniz' *Dyadik* (celebrated today for its reduction of mathematical calculation to binary numbers) was still presented within the frame of a religious view of God's creations, as expressed by Leibniz as "wondrous creation from Zero and One". The epistemic rupture is dramatic and should not be confused with present nostalgia. The present Internet is a result of

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[95] Koeppe, as quoted in: Breen 2012

[96] Barbara Stafford, Visual Analogy. Consciousness as the art of connecting, xxx, 121

[97] Stafford: 122

[98] For the Oslo Ultima Academy Festival installation of a contemporary Wunderkammer, Ask Brean has created a "DNA" visualization of Bach's composition *Das musikalische Opfer* indeed.

[99] Friedrich Kittler, Ein Tigertier, das Zeichen setzte. Gottfried Wilhelm Leibniz zum 350. Geburtstag, in: *mtg* (Medien/Theorie/Geschichte), bulletin of the DFG Research Network *Theorie und Geschichte der Medien* (1996); http://www.uni-kassel.de/wz2/mtg/archiv/kittler.html

[100] Foucault, xxx, 52f

algorithms. What looks like a curiosity cabinet on the "content" level is in fact an audio-visual or narrative dissimulation of data strings.

Are similarities between objects and images strictly formalisable, to be revealed by algorithmic pattern recognition? It is the task of the robot scholar to uncover and display this unexpected coherence - a mathematical kind of archaeology of knowledge, based on the assumption that what looks contingent to men, is a hidden coherence in computational eyes. What looks like the digital "recursion" of the Baroque curiosity cabinet in the Internet is based on a fundamental mathematical classification. Nowadays it is the computer which processes images of the *Wunderkammer* as data-sets. Once it has been digitized, visual content of museums becomes alpha-numerically addressable, and wondrous new options of mobilizing the inherent information by intelligent algorithms arise.

[Memory games: A media archaeology of curiosity cabinets]

Software imposes structure on the apparent disarray of phenomenal data sets by searching for matches amongst the otherwise jumbled elements[101]. Montaigne once supposed that similitude binds everything together; with this poetic epistemology, similarity-based algorithms of image organization in the present correspond.[102]

But for more sophisticated forms of visual rhetoric algorithms are not yet capable; digital computing so far can not really identify the whole of an object from the sight of a part of it. "The computer is no good at spotting associations between seemingly unrelated pieces of information and deriving generalizations" of images.[103] Fuzzy computer-sorting might begin to make useful comparisons of similar but not identical images on the basis of new protocols, just like neurons in the human brain do not primarily process, recall and transfer iconological content but rather *patterns* of visual memory; the image here exists rather in a structural, that is: *archival* latency.

The hanging of pictures: Order *versus* entropy

By similarity-based algorithms of image organization in the present, computers juxtapose pictire elements according to exact numerical neighbourhood; their patterns are to be read as comparative juxtapositions, "as a system of potential matches"[104]. In fact the storage management of visual content in computer

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[101] Cp. Claire Preston, In the Wilderness of Forms: Ideas and Things in Thomas Browne´s Cabinets of Curiosity, in: Neil Rhodes / Jonathan Sawday (eds.), The Renaissance computer: knowledge technology in the first age of print, London / New York (Routledge) 2000, 170-183 (174 f.)

[102] Michel de Montaigne, Oeuvres complètes, ed. Albert Thibudet / Maurice Rat, Paris (Gallimard) 1962, 1047

[103] Davies et al. 1990: 61

[104] See Claire Preston, In the Wilderness of Forms: Ideas and Things in Thomas Browne´s Cabinets of Curiosity, in: Neil Rhodes / Jonathan Sawday (eds.), The Renaissance computer: knowledge technology in the first age of print,

memory rather adopts the old "St. Petersburg hanging" of pictures at the wall according to spatial economy of formats rather than according to subjects or as historical sequence in period rooms. Apparently likewise, the photo-aesthetics of a blogging-platform like Tumblr is literally based on the *tumbling* of images.[105] What articulates itself here, is the appeal of the "anarchive" which is closer to the *matching* of items in the *Wunderkammer* than to the modernist archival tectonics.

The return of the *Wunderkammer*?

It is the code which governs computer graphics; highly structured algorithms define unexpected constellations. In that sense, Friedrich Kittler once predicted the return of the *Wunderkammer*.[106] The ultimate digital Wunderkammer of today does not simply archive snapshots from the Internet but hardware architectures and software solutions as well - to preserve the validity of mathematical algorithms. The apparent return of the Wunderkammer in Web 2 - like the archival metaphor for the Internet - is only superficial; on the infrastructural level, a complete transformation has taken place: from contingent objects to rule-governed calculation.

The material artefact with its physical presence can not easily be emulated by reproduction in virtual space - unless the object is scanned in 3-D and can be calculated in its visual vectors in *n*-dimensional space, analytically becoming even more accessible than any object in physical display.

The "imaginary museum" (as defined by André Malraux) once started with photography[107] and became even more dynamic with Aby Warburg's *Mnemosyne Atlas* which is based on the idea of permanent experimental reordering of photographic reproductions of art works by iconological or orther affinity. The very affordance of the technical reproduction induced such new epistemic operations - to be continued in algorithmic space.[108]

"Searching pixels"

In a Flash animation on the still existing website of the *Searching Image* project from 2001 an array of moving pixels progressively associates with each other by colour similarity.[109] Is the computer capable of more sophisticated forms of visual rhetoric? "The computer is no good at spotting associations between

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London / New York (Routledge) 2000, 170-183 (174 f.)

[105] Siehe den taz.de-Artikel vom 9. April 2010, Microblogging mit Tumblr. Das Durcheinandertagebuch, http://www.taz.de/!50880

[106] TS Kittler: 8, referring to: Horst Bredekamp, Antikensehnsucht und Maschinenglaube. Die Geschichte der Kunstkammer und die Zukunft der Kunstgeschichte, Berlin (Wagenbach) 1993

[107] André Malraux, Psychologie de l'art – Le musée imaginaire, Geneva 1947

[108] See Stefan Grohé, Die Verfügbarkeit der Bilder. Museen und Medien, in: Darsow (ed.), Metamorphosen, 151– (esp. 166)

[109] www.suchbilder.de

seemingly unrelated pieces of information and deriving generalizations" of images.[110] Neurons in the human brain do not primarily process, recall and transfer iconological content but rather *patterns* of visual memory; the image here exists rather in a structural, that is: *archival* latency. "Fuzzy" computer-sorting has begun to make useful comparisons of similar but not identical images on the basis of new protocols, but the strength of computing does not develop by just emulating human image perception.

[Internet / Wunderkammer]

In his article "Cabinets of Curiosity: the Web as Wunderkammer", written for *The Appendix* blog[111], Benjamin Breen refers to well known Wunderkammer representations in the Internet, such as Frans Francken's painting of a Kunstkammer, 1636. But "behind" such a digitized image in media-archaeological analysis, it turns out as a RAM image, symbolically represented rather by hexidecimal code then by visual pixels - the mathematical *Wunderkammer*. Is this a weak, even misleading metaphor? Breen takes "the ecosystem of Pinterest" for example, and finds here "the same organic arrangement of contrasting items, grouped poetically (rather than rationally) around a nebulous theme" (Breen), like in a Baroque Wunderkammer. "The eclectic and exotic are prized; color and visual interest win the day." The context for each item is "virtually nonexistant" (Breen ibid.).

Likewise YouTube, Flickr, MySpace for film, photo and sound; Facebook for text. Tumbl as a mix of all was founded in 2005 by David Karp who originally created his blog for thought fragments appropriately called *Anarchaia*; net links and quotes were called "tumblelog". The Tumbl button allows to immediately "appropriate" quotes (and images, sounds) from the Internet into one's own blog as virtual *Wunderkammer*.[112]

There is an obvious temptation or even desire for *de*contextualizing images, for freeing them from their strict placement in the art historical context. Here the fascination with the out-dated Baroque *Wunderkammer* comes in, as museological "attention to aesthetic forebears that lie outside the austere traditions of minimalism and modernism. Perhaps the pendulum is swinging back to a Baroque celebration of diversity of forms, asymmetry, eclecticism and a more poetic sensibility that injects a degree of intuition and randomness into the realms of machine intelligence and digital communication", Breen comments. But then, the current appeal of the curiosity cabinet and *Wunderkammer* is not simply nostalgic but rather a retro-effect, a *dèjà vu* of the Internet warehouse aesthetics with its apparent chaotic shelfing: The ways

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[110] Davies et al. 1990: 61

[111] Posted by Benjamin Breen on November 28, 2012; http://theappendix.net/blog/2012/11/cabinets-of-curiosity:-the-web-as-wunderkammer; accessed March 9, 2015. Benjamin Breen is the editor-in-chief of The Appendix and a PhD candidate in history at the University of Texas at Austin

[112] See taz.de (the Berlin daily journal Die Tageszeitung), article from April 9, 2010: "Microblogging mit Tumbls. Das Durcheinandertagebuch", http://www.taz.de/!50880

a *Wunderkammer* creates surprising juxtapositions between objects and ideas that usually don't belong together looks familiar to virtual navigation within online worlds. In fact, the labels are here literally *inscribed*: Each image pixel itself is a numerical address, thereby the opposite of the non-mathematical Wunderkammer arrangements.

While there is no centralized directory in the Internet, search engines "provide navigation methods just as labeling of items in a 1500s curiosity cabinet led viewers through the myriad of items it contained <...>."[113] But "unlike the curiosity or wonder cabinet that only accepted items that the owner deemed appropriate, the freedom to add to online content and categorize without oversight from a single governing entity allows for an ever-changing and adapting environment <...>."[114]

Similarity-based dis/order (Legrady's SOM)

The human brain itself operates by association which is explicitly emulated by similarity-based retrieval algorithms like the Kohonen Self-Organizing Map[115] which, in turn, has been applied by George Legrady's media art intallation *Pockets Full of Memories* in the Paris Beaubourg. The linear order of visual motives is here replaced by minute recognition of differential values (the *Delta* drive).

Computer scientist Teuvo Kohonen divides the memory models into two main categories: *physical-system* models and *information-processing models*[116] - which separates the Baroque *Wunderkammer* from its algorithmic version in the Social Web of today. For Internet culture today, WEBSOM has been developed by the Neural networks Research Centre at Helsinki University of Technology, as a method for automatically organizing collections of documents and preparing visual maps of them to facilitate the retrieval of information.

In Legrady's media art installation *Pockets Full of Memories*, visitors were invited to first scan personal items and then ascribing values to then by means of a computer touchscreen with a pre-set questionnaire. The resulting values as database then led to the algorithmic placing of scanned objects on the large two-dimensional map.[117] On this visible surface, the "imaginary museum" does not place incoming objects in a pre-existing spatial order but was in constant

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[113] Jessica Ezell, The Internet as Cabinet of Curiosities, in: Information in Social and Cultural Context (Spring 2012), http://blogs.ischool.utexas.edu/inf380c/author/ezell; accessed: March 23, 2015

[114] Ezell 2012

[115] See Teuvo Kohonen, Self-Organization and Associative Memory, Berlin / Heidelberg / New York / Tokyo 1984

[116] Teuvo Kohonen, Self-Organization and Associative Memory, Berlin / Heidelberg / New York / Tokyo (Springer) 1984, 4

[117] See Sven Spieker, On the Question of Archives and Entropy in Contemporary Art (Legrady, Muntadas), in: Krzysztof Pijarski (Hg.), The Archive as Project. The Poetics and Politics of the (photo) Archive, Warschau 2011, 114-126 (116 f.)

motion, driven by the visitor's tags to their individual object contribution which were organized through the self-organizing map algorithm. But this combination of user-generated emotional, semantic content and computational method still confirms the human agency instead of being more radically driven by the distribution of shapes, textures, colours etc. from the scanned objects themselves.

The real *archive* in the strict Foucauldean (and Kantean *a priori*) sense as condition of possibility for enunciative statements like this, though, hides within the order of the Kohonen self-organizing map and stays strictly immobile (not changing a single source code line during the installation). Against the metaphorical visual interface, a different map (as archival diagram) is at work here. What might look like randomness in the dynamic re-placement of visible objects therefore is heavily structured[118] on the archaeological level of media operativity.

A more radical version might order the digitally scanned objects according to formal criteria by truly image-based sorting such as order by shape or by colour distribution. When applied to collections of art historical motives, the evolutionary order is thereby replaced by the differential drive to find similar patterns.

Even if still "tagged" by human semantics, once being sorted by algorithms in a data bank, such image clusters invite to be analyzed in non-human machine aesthetics as such - statistically resulting in color histograms, or in hybrids of color distribution and human labelling.

With effective algorithms, for the first time, the image archive can organise itself not just according to external verbal description, but according to criteria proper to its own data structure: an endogenic visual memory in its own medium. By translating analogous photographic images (including film) into digital codes, not only do images become addressable in mathematical operations, their ordering as well can be literally calculated. While the traditional photographic archive still represents a spatial order ("l'espace de l'archive"[119]), today the online image archives themselves take place in time. Dynamic access to image archives is a flexible tool which allows for the coexistence of different orders without destroying the existing database structure.

The radicalized Wunderkammer: Constant's *Active Archives*

The *Wunderkammer* is radicalized by media-archaeological analysis, when the term "radical" is understood in its mathematical sense: the square root. Automatic feature extraction of objects in large digital image banks at first results in a Wunderkammer-like effect. Very often, what the cluster of features reveals is rather puzzling at first glance. Such probes have been assembled by

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[118] Spieker 2011: 117

[119] Michel de Certeau, L´espace de l´archive ou la perversion du temps, in: Traverses. Revue du Centre de Création Industrielle No. 36, January 1986, 4-6

the Bruxelles-based research art collective Constant (Active Archives). By such techno-mathematical operations, the ratio is revealed which replaces "God's gaze" as supposed in the baroque Wunderkammer image ontology.

While the juxtaposition of the matching features can sometimes be understood by humans intuitively to look alike, in other image clusters, the ratio that connects them seems to evade human visuality and stays hidden in their algorithmic morphology. Nowadays, there are non-human visitors to the new *Wunderkammer* which apply distant reading - the media-archaeological gaze.

Image-based image retrieval and sorting algorithms should not try to emulate high-level human perception or even to hermeneutically "understand" an iconological scene, but rather discover zones that have specific unforseen characteristics, in a productive incommensurability between the algorithmic output and what appeals meaningful to human recognition.

The sonified *Wunderkammer*

The current electro-sphere, appropriately defined as synchronous "acoustic space" by Marshall McLuhan, separates the new Wunderkammer from its visually oriented historic version - since all is different when the Wunderkammer objects become sonic and methods of "digital archaeology" as operative image analysis are being used to sonify the image-as-memory itself, resulting in a continuously evolving composition. This is no deliberate, but a algorithm-based, rule-based, in strictly Foucauldean terms *archival* transformation[120], giving a voice to the Wunderkammer, sonifying the artefactual collection.

Beyond the notorious Vocoder (the electronic device for speech synthesis resulting from spectrographic speech analysis for efficient voice transmission), the natural itself can be given a "voice" by un-natural means. In Ryan McGee's, Joshua Dickinson's and George Legrady's multimedia installation *Voice of Sisyphus*, a black & white photographic image from the 1970s displaying a hotel scene "At the Bar" is filtered by a computer program which then reads the segments and produces sounds out of them.[121] From a digitally scanned image of a Baroque Wunderkammer as well, several regions and items can be automatically identified and then repositioned over time, therefore allowing for the subsequent sonification of the items. "Unlike the spectrograph approach used by most graphical synthesis programs, such an image-to-sound technique is derived from raster scanning of pixel data. By adding frequency domain filters, polyphony within a single image can be archieved.[122] Sound spatialization filters and segmentation algorithms thereby try to "make sense"

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[120] Ryan McGee (image analysis, audio and spatialization software), Joshua Dickinson (assisted with the audio composition software), George Legrady, VOICE OF SISYPHUS: AN IMAGE SONIFICATION MULTIMEDIA INSTALLATION, presented at: The 18th International Conference on Auditory Display (ICAD-2012), June 18–22, 2012, Atlanta, USA

[121] See http://vimeo.com/30238729 <alternatively: https://vimeo.com/34859885

[122] See McGee / Dickinson / Legrady 2012, "abstract"

of a *Wunderkammer* from a signal processing point of view. What human visual perception recognized as shapes and *Gestalt* does not sound melodic when audified: "Non-acoustical data is inherently noisy when audified since it is not a time series of pressure data obeying the wave equation" (McGee et al.).

Digital scans of Wunderkammer paintings can be converted into its sonic equivalents as MP3 files, based on defaults of the sonification software Photosounder - which, as a re-entry of the *Wunderkammer* as its diagrammatic image, can be in return visualized in its wave forms and frequency domain.[123]

On the y-axis of such a digitized image, each line of pixels, by means of parameter mapping, is related to a defined frequency generated by an oscillator (sine tone generator). Line by line a spectrogram is being produced in which periodicities or non-periodicities can be detected and thereby can be sonified. By sonifying the otherwise spatial configuration of the *Wunderkammer*, its temporalization unfolds: no more museum, but music. From that results a really (electro-)acoustic Wunderkammer, or a huge archive of sound items from techno-mathematical culture.

VIDET: MEDIA ARCHAEOLOGY AS SUBJECT AND OBJECT OF ELECTRONIC IMAGING AESTHETICS

Media archaeology is a method of technological analysis, as well as an aesthetics of perceiving "media" signals, and finally "computer-aided" research enacted by analytic media themselves. All three varianced can be applied to what has been "analog video" and the epistemic object "videocity". Finally, "radical" (in the techno-logical sense) and "rigorous" (in the critical sense) media archaeology is required for the analysis of the "digital image".

The video tube *avant la lettre*. Media archaeology as research method

Media archaeology is *en vogue* in media studies; path-breaking have been the writings of Siegfried Zielinski such as *Deep Time of the Media* (even if more recently Zielinski prefers the term "variantology"[124]). Path-breaking have been Bruce Sterling's "Dead Media Handbook Project", and the writings of Erkki Huhtamo, and notably Jussi Parikka more recently.[125] There is a soft version of "historical media archaeology", which is rather about bringing "dead media" knowledge back to consciousness again into contemporary digital media culture; another school of Media Science rather experiments with writing media time in non-historiographical terms and narratives.

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[123] See http://photosounder.com, Demo version

[124] For a "variantology" which is at the same time technically precise, see especially Siegfried Zielinski / David Link (eds.), Variantology 2. On Deep Time Relations of Arts, Sciences and Technologies, Cologne (Walther König) 2006

[125] See Erkki Huhtamo / Jussi Parikka (eds.), Media Archaeology. Approaches, Applications, and Implications, Berkeley / Los Angeles / London (University of California Press) 2011

Media Archaeology is both a field of study and a method of inquiry. First of all, it strikes sparks of knowledge from *from within* technology. The art of such closest reading is media philology. Let us destinguish media archaeology, in its rather epistemologic understanding, from what it is not, to avoid misunderstandings. Only occasionally it is about digging out obsolte media from the past or to remember alternatives to existing technologies.[126] Media Archaeology defends the "antiquarian" approach to machines and automata indeed, as way of very haptic reexperiencing technological materialities from the past, even if antiquarianism in nineteenth und 20th century came to be considered antiquated itself and has been replaced by philosophies of cultural history as background discourse for research into past materialities.[127] Antiquarians once practice(d) what the archaeologist Eduard Gerhard once successfully termed "monumental philolology", which became "forensic analysis" in terms of Matthew Kirschenbaum. Material knowledge of the past grants a certain independence from being all too immediately absorbed into the symbolical order of narrative historiography. A notorious case for *technological reasoning* which never looses touch with actual technological devices is Gilbert Simondon's seminal philosophy of technology from 1958, called *On the Existence of Technical Objects* in English, where he carefully analyzes the themionic vacuum tube (and its differentiations from Diode to Triode to Pentode etc.) - the device which gave rise to the meaning of "electronics", itself different from mere energetic electrics (a cetegory sometimes confused in the media theory of McLuhan).[128]

While Michel Serres in a convincing example demonstrates that there is not simply "new" machines or media but rather a coexistence of elements from different times in the same operating system like a car with all its ingredients ranging from the pre-historic wheel to the combustion motor, Simondon rather directly focuses on the starter which initiates the motor action by a delicate combination of electro-magnetic triggering and its energetic transduction into a motion impulse to start the repetitive rhythm of the motor.

Electronics is defined by the subte, "intelligent" application of micro voltages to manipulate current based events, where the current is not used for energetic purposes like in a traditional light bulb but to modulate the flow of electrons within a vacuum glass body itself.

The thermionic tube can be regarded as a major player in media art, if it is not reduced to its external appearance as "the tube" as monitor interface. It began its career as a radio amplifier, but as a picture tube, it is the only instance of an "internal" electronic element becoming human-machine-interface as the same time. The tube has been (mis-)used much later as a digital switch for the pure processing of information.

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[126] See the transcript of an interview by Thomas Hill, Vassar College, Dept. of Art, Poughkeepsie, N. Y., on occasion of W. E., *Digital Memory and the Archive*, in the academic radio program *Library Cafe*, http://library-cafe.org
[127] See W. E., Let there be irony. Cultural history and media archaeology in parallel lines, in: *Art History* Bd. 28.5 (November 2005), 582-603
[128] Gilbert Simondon, Du Mode d'Existence des Objets Techniques, Paris (Aubier) 1958; reprint 2005

In the seminal chapter one "The Medium is the Message" of Marshall McLuhan's *Understanding Media* from 1964, the author points out that the light bulb is pure medium, unless it is used for informational purposes, such as light-bulb based optical Morse code in telegraphy. With a flip-flop circuitry consisting of basically two coupled thermionic tubes for binary switching, the basic unit of information, the "bit", the evacuated light bulb re-entered the media theatre, this time not for its electric, but electronic capacities.

Thomas Alva Edison rather occasionally experienced this techno-epistemological difference the moment when his object of experimentation, the evacuated glass bulb, sublimely produced what later became known as the Edison effect: a shade of colour produced by the electron flow at the anode end of the evacuated glass bulb, like a first video or TV tube *avant la lettre*. Sometimes technological objects have implicit knowledge even before any human even has an idea of its meaning and use. Instinctively, Edison made sure that this phenomenon observed in 1875 and refined in 1883, while trying to improve his new incandescent lamp, got patented. But this is not media phenomenology at all, but electrons in action. In a vacuum, electrons flow from a heated element - like an incandescent lamp filament - to a cooler metal plate - the classic example of thermionic emission.[129] How to write such persistent electronic media events (which eventually resulted in the video and television tube) not simply in terms of history of cultural modernity?

An abbreviation of "Media Archaeology"

The term "archaeography" is indicates alternatives models of writing the being of media in time, thus: an alternative to narrative historiography of media "origins" in the historic sense, rather the indication of another level of media tempor(e)alities: its persistent governing principles, archaic essentials which endure into the present.

Media Archaeology encompasses a variety of approaches to media, all of them are interrelated but as well differentiated. As a method of media analysis, it addressies the structural (material *and* logical) preconditions of media practice which Foucault named as *l'archive*, such as Internet protocols[130] or the von-Neumann-architecture of digital computers. Furthermore, Media Archaeology is an aesthetics (the "cold gaze" of distanced understanding); it is an "archivology", that is: deeply obliged to archival evidence and technological precision (circuit diagrams and literal source code as source of evidence). There is a certain nostalgia for the analogue indeed in the media archaeological impulse - but this should be kept private. In addition, Media Archaeology is an art form (to name Paul DeMarinis' installations) which reduce contemporary media complexit to its basics as opposed to the intangible hiddenness of micro-chips in ubiquitous computing today ("reduced to the max"). It is a form of generating knowledge with technical media themselves as active agents, even archaeologists, like digital signal processing restored early "phonographic" recordings of John Logie Baird's experimental 30-line electro-mechanical

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[129] https://en.wikipedia.org/wiki/Thermionic_emission, accessed October 2, 2017
[130] See Alexander Galloway, Protocol. How Control Exits after Decentralization, Cambridge, Mass. / London (MIT) 2004

television. An echo from the media-artistic side is Gerhard Sengmüller´s *VinylVideo* project. He calls his undertaking a "piece of faked media archaeology"; it shares with technically serious media archaeology the bias to reminds viewers of the basic, even archaic *principles* of TV image functions - reducing electronic complexity to their technological *arché*.

Media Archaeology is a gesture of "open source" indeed, literally deconstructing hardware: not simply in the sense of public usage of source codes in programming, but in the sense of dismantling media from their designed enframing, unclothing the chassis. As an approach to the materiality of media, Media Archaeology is akin to Classical Archaeology which deals with the material remains of a culture, different from literary hermeneutics.

But there remains the risk of getting seduced by the archaeological metaphor. On occasion of the February 2004 festival "An Archaeology of Imaginary Media" at De Balie in Amsterdam it became apparent that many authors take the term "media archaeology" at face value, almost metaphorically: referring to the "digging out" of forgotten machinic visions of the past, of alternative media in the baroque, f. e., media which were never materialized or which are simply forgotten today. Media archaeology is n o t about beginnings, about origins in the temporal sense, but rather about the *arché*, the laws governing media in action. These principles are rather structural than temporal, though it happens that at its emergence a medium most openly reveals its structures before it becomes dissimulated by interfaces.

The "cold gaze" is a description of the media-archaeological aesthetics indeed, admittedly close to Ernst Jünger's photographic media aesthetics. German pre-war or on-war engineering culture still lurks through, just like Heidegger's way of fundamentally re-thinking the categories of technology. After the proudly acclaimed "acoustic turn"[131] and the emergence of Sound Studies, the "cold gaze" is accompanied by unpassionate "understanding", listening to *sonicity*, that is: sound emerging from within technomathematical media.[132]

Media Archaeology is techno-centristic, that is: machine- and code-centered indeed.[133] While Media Phenomenology concentrates upon the mostly screen-based media effects on humans (for which the opaqueness of its technology seems almost mandatory not to divert physiological attention), Media Archaeology intends media-awareness by making "transparent" its technology itself, opening the proverbial Black Box. The field of (new) media theory seems split between two very different approaches: "Media archaeologists [...] describe the non-discursive practices of the techno-cultural archive. Media phenomenologists [...] analyze how phenomena in various media appear to the human cognitive apparatus, that is, to the mind and senses."[134] The

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[131] Petra Meyer (ed.), acoustic turn, Munich (Fink) 2008

[132] "Where are the ears of the machine", Morten Riis asks in an essay published in the online journal xxx

[133] As expressed in Wendy Hui Kyong Chun, Introduction. Did Someone Say New Media?, in: New Media, Old Media. A History and Theory Reader, eds. Wendy Hui Kyong Chun / Thomas Keenan, New York / London (Routledge) 2006, 1-10 (4)

[134] Kjetil Jakobsen, in chapter 6 of his text "Anarchival Society", discusses

archaeological / archivological approach is rooted as much in Foucault's definitions[135] as it is connected with Marshall McLuhan's non-contentist media analysis. Whereas Mark Hansen in his media-phenomenological discussion of what is an "image" in the age of new (that is, electronic and digital) media, in an explicit Bergsonean tradition insists on the coming-into-being of the mediated image in the "enframing" acts of the human bodily cognition only[136], "posthuman cultural studies"[137] radical media archaeology takes the point of view of the machine itself, with the quality "radical" to be interpreted in two ways: going to the roots (which is the archive), to the beginnings (less historic causality but temporal originality: the opening and generation of the time-critical *momentum*[138] and of temporal horizons), and in the sense of the mathematical square root as the constitutive force in algorithmic, technological media. So-called software studies[139] and a refreshed materialist (forensic) approach[140] on both sides of the Atlantic join in. Media Archaeology is close to mathematics indeed. Foucault took enunciative logics instead of (like Hegel) cultural history as the foundation of his archaeology of spirit. Thus a notion of *Archeology of Knowledge* comes into play which does not want to be understood metaphorically or philosophically, but strictly mathematically: as the study of enunciative functions.[141]

Soft *versus* analytic media archaeology: theory and method

The ancient Greek component *arché* in the term *archae*ology does not exclusively refer to origins but as well to principles, to structures; media archaeology thus aims at revealing the essential principles which drive media in the technological sense (both material hardware and symbolic software). Media Archaeology makes salient those technological elements which (beyond the special knowledge of engineers and mathematicians and computer scientists) are worth of knowledge beyond experts in a philosophical sense, while at the same time, the methods of Radical Media Archaology rather have the ambition to turn Media Studies into Media Science.

"Archaeology versus phenomenology", in: Eivind Røssaak (ed.), The Archive in Motion. New Conceptions of the Archive in Contemporary Thought and New Media Practices, Oslo (Novus) 2010, 127-154 (141)

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

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

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

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

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

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

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

The crucial question which differentiates Media Archaeology from Science & Technology Studies is this: Are machines really "social before being technical"[142]? Recent STS place technological development within a broader social, discursive and cultural frame of reference; an exemplary analysis of the layers unfolding from techno-endogenic research, then technological implementation, to final media-economic application is Hugh G. J. Aitken's monography *Syntony and Spark* on "The Origins of Radio" (subtitle)[143].

Radical media archaeology rather looks at the epistemological *momentum* behind the subsequent re- and discoveries, at techno-mathematical constellations rather than for media-sociological roots. Such moments erupt as conceptual discontinuities, physical thresholds, technical limits and data series - as (non-technically) expressed in the introduction to Foucault´s *The Archaeology of Knowledge*.[144] Such discontinuities frequently arise from within technological devices before they become modified into what is commonly known as media itself, by endogenic "revolutions" (in Thomas S. Kuhn's sense of paradigm shifts), therefore answering for *dis-continuing* philosophical shifts of questions and tools on the human analysis side such as "cultural analytics", as practiced by media scholar Lev Manovich for "big data" in contemporary image-based communication.

Media, if conceived as physical channels of communication and as techno-mathematical artefacts which are operated by symbolic codes and streaming data, ask to be analyzed in ways different from texts or works of art. The archeological gaze (*theoría* in the ancient Greek sense of "insight") a way of looking at media objects enumerative rather than narrative, descriptive rather than discursive, infra-structural rather than sociological, focusing on the alphanumeric code underlying screen-cultural images. Images from data themselves bring to the American Standard Code for Information Interchange (ASCII), based on a seven bit structure, which in early days of computing was used for transmitting photos and graphics as well by pixeling the visual information and translating it into the available 128 characters. Different art projects refer to this digital Stone Age, such as *ascii Vision* in the context of the works of the *ascii-art-ensemble*.[145]

Positioned between archaeology as academic discipline for analyzing material culture from the past and the Foucauldean notion of *l'archive* as the set of rules governing the range of what can be verbally, audiovisually or numerically expressed at all, media archaeology is a methodic way and aesthetics of practicing media studies and media criticism, an effort to re-enact apparently "dead" media and their reverse engineering, and an awareness of moments

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[142] Gilles Deleuze, Foucault, trans. Seán hand, Minneapolis 1988, 13

[143] New York / London / Sydney 1976

[144] The Archaeology of Knowledge [FO 1969], New York (Routledge) 1972. For an current media archaeology of cinema, see Thomas Elsaesser, Film History as Media Archaeology. Tracking Digital Cinema, Amsterdam (Amsterdam UP) 2016

[145] visomat inc., asciiVision, in: Thomas Y. Levin, Ursula Frohne / Peter Weibel (eds.), CTRL[SPACE]. Rhetorics of Surveillance from Bentham to Big Brother, Cambridge, Mass. (MIT) / Karlsruhe (ZKM) 2002, 372

when media themselves, not exclusively humans any more, become active "archeologists" of understanding and insight, such as imaged-based image retrieval within digitized media archives. Beyond Marshall McLuhan, media are not just extensions of men any more, but become chrono-poetic themselves.

Media Archaeology *versus* Cultural Techniques": *Kulturwissenschaft* and / or Media Science?

A critical differentiation between *Kulturwissenschaft* and Media Studies allows for the concept of "cultural techniques" to be located *outside* radical media archaeology. Media archaeology as research method does not describe media phenomena in discourse analysis, but seeks for their grounding - *Erdung* - in material and/or logical artefacts. While film studies and social history generally discuss the emergence of sound film (after the age of silent movies) in terms of social discourse and narrative content, media archaeology focuses on the photo cell as the electronic *a priori* for the emergence of sound film in the late 1920s.[146] The photoelectric event, though, is "cultural technique" no more.

Case photography

There is an active archaeological discontinuation of evidence and aesthetics from the human body and mind by technical devices themselves. The media-archaeological approach is "anthropodistant"; the painter and draughtsman William Henry Fox Talbot, know as inventor of negative photography, explicitely celebrated the liberation of painting from the human hand by an apparatus for self-registering nature. When Talbot supplemented the traditional *camera obscura* by a medium for recording and reproducing light-based imagery, he celebrated the liberation from his subjective, "interpretative" painterly hand by the apparatus which does not understand but register light intensities of silver halogenite crystals - different from copper engraving of lithography which still is a kind of interpretative "criticism" of the image to the reproduced (Segolen leMen).

The camera obscura already "cannot be reduced either to a technological or a discursive object: it was a complex social amalgam in which its existence as a textual figure was never separable from its machinic uses. ... the camera obscura must be extricated from the evolutionary logic of a technological determinism"[147], which narrates is "as a precursor or an inaugural event in a genealogy leadint to the birth of photography" <ibid.>. But in terms of media archaeology, the "inaugural event" is not only fixed to its historical invention and evolution but techno-structural: ongoing and embedded in later escalations.

Talbot, in 1840, photographically reproduced a manuscript.[148] In hat moment,

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[146] See Paul Hatschek, Die Photozelle im Dienst der Tonfilmwiedergabe, Halle (Wilhelm Knapp) 1948

[147] Crary 1990: 31

[148] Karl Krumbacher, Die Photographie im Dienste der Geisteswissenschaften, in: Neue Jahrbücher für das klassische Altertum 17 (1906), 601-660 (607)

the record becomes object of a light processing technique - which has nothing interpretational while it happens, resulting in a media-archaeologically distant, apparatus-based recognition of a text as an optical signal event - just like Dziga Vertov ("kinoki") and Ernst Jünger asked for the "optische Distanznahme" and the "kalte Person": lessons to learn from technical signal processing. Discourse (kontext -dependency) is replaced by apparative observation. Talbot in his introduction to *The Pencil of Nature*: The photographic plates „have been formed or depicted by optical and chemical means alone, and without the aid of any one acquainted with the art of drawing" - a media-archaeolgical radicalisation and discontinuity with artistic *mimesis*, semantics and hermeneutics of images: „The picture, divested of the ideas which accompany it, and considered only in its ultimate nature is but a succession, or variety of stronger lights thrown upon one part of the paper, and of deeper shadows on another."[149] This today is high resultion in digital *scanning*. „The instrument chronicles whatever it sees, and certainly would delineate a chimney-pot or a chimney-sweeper with the same impartiality as it would the Apollo of Belvedere"[150] - and such "chronicles" are different from hand-held *Annales* in medieval times

The surgical camera gaze: "Images" from data

To go further with Foucault, there is an analogy between the media archaeological and the medical observation.[151] With the surgical gaze becoming more and more dependent on *imaging* technologies, both perspectives converge literally.[152]

While human cognition takes the (moving) technical image for granted, that is: as "given", and focuses on *gestalt*, Media Archaeology analyses the time-critical *coming-into-being* of what humans (mis-)concive iconically, sonically, or textually.

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

Once digitized, images can be algorithmically calculated and intrinsically navigated. After all, why should we always try to force the semantic criteria of human image understanding upon the computer? On the contrary, the entirely different criteria of image similarity in computing may leed to unexpected insights in visual culture. Beyond human semantic tagging, nonhuman metadating of "image" or "audio" files no longer forces a foreign medium (texts) upon the data, but approach them in their own digital logicity. Literally

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[149] London 1844; Reprint New York: DaCapo Press 1969, o. S.
[150] Ebd., Text zu Tafel II „View of the Boulevards at Paris"
[151] See Michel Foucault, Birth of the Clinic, xxx
[152] See Markus Buschhaus, Über den Körper im Bilde sein. Eine Medienarchälogie anatomischen Wissens, Bielefeld (Transkript) 2005, 171

"on the other side", media archaeolgy deals with time-critical psycho-physical perception as well. Thereby media archaeological analysis operates in well-differentiated, still (in its distanced "view") parallel lines to the neuro-scientific approach.

Some human perceptual processes "operate upon data on the screen in a direct, bottom-up manner by examining the data in very brief periods of time (utilizing little or no associated memory) and organizing it automatically into such features as edge, color, depth, motion, aural pitch <...>."[153] Such bottom-up perception is media-archeological *aisthesis* indeed.

Media archaeology is akin to the gaze of the optical scanner. Such as the electronic tunnel microsope does not actually transfer images of the atomic surface of matter, but analyses its object by matching data statistically and reprsenting these calculations as images - just like bats don?t perceive space iconically, but by echo orientation in space[154] - culture-free images.

The signifying decipherment of images is not a priviledge of animals alone any more. There are now options for search enginges: visual search with precise targeting, down to each pixel in an image. Such monitoring systems perform a different panoptical regime: they do not concentrate on iconology, but on data patterns and clustering. David Gordon's video art installation *24 hours Psycho* media-archaeologically undermines Hitchcock's film story by slowing it down, just as Angela Bulloch's "Pixel Works", dissolves the cinematographic frame, after digital sampling, into discrete macro-pixels.

An image, for media archaeologists, is different from what an image is to art historians or Visual Studies. The media archaeological gaze is close to radar which is rather a "system of measurement rather than communication"[155]. Radar is an analogue technique rendering a physical image (rather map) of the surrounding area of an antenna, while on the level of signal transfer it operates with discreet impulse- and duplex technology. Thus the radar image is rather "analytical" (in Timothy Barker's sense), a measuring device, than a medium of representation or projection. Both though, TV and radar, are based on the same cathode ray tube; the German TV set which was ready to go into mass production in 1939 was immediately converted to military uses after the outbreak of World War II.

Focus video art: Notes on videocity

Media-archaeological aesthetics corresponds with the signal *aisthesis* of the machine, as embodied in sensors and transducers. Optical media are suspended from the burden of cultural semantics indeed, in favor of the techno-cultural form; on the contrary, it requires high-performance computing concepts such as "Deep Learning" (Henson) to train machines a sense of cultural iconologies. The media-archaeological answer to this aim is an

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

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

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

emphasis on the radical difference between human and machine reasoning (after acknowledging, with Turing 1936, their structual isomorphism). This dramatic difference should not be smoothed or humanized in the media-theatrical scenes interfacing human and machine perception, such as the computer screen, but rather drastically put on display there.

Latin "video" is an anthropocentric term of a technological event: "I see"; the human "eye" and its coupling to the mind "I" might be contrasted by Latin "videt" which means "it sees" in the sense of transducing light into electric signals *vice versa*: the technological gaze of the Cathode Ray Tube itself, and already Vertov's kinematographic "camera eye".

The implicitly sonic, sequential "one-line scanning" of electronic imagery (as defined by video artist Bill Viola and Maurizio Lazzarato's *Video Philosophie*) radically differs from the retinal image projected in the human eye and transduced in a bundle of parallel nerve channels to the electric signal processing brain. Different from katoptic film screen projection, the luminosity of the electronic cathode ray tube; comes from within and invites for media-archaeological inspection, tracing back the electronic "image" event. TV is rather derived from the telephone, in terms of Nipkow's techno-epistemic trick of turning a two-dimensional image into one-line scanning for transmission over a single channel (be it cable, or "wireless" signal transmission).

Video steadily reproduces, regenerates an image as a light-event, instead of projecting a fixed prefabricated image like film does. At this point video image is akin to the neurological process of memorizing and remembering.[156] With its flashing and fading, the temporality ("to death") of the electronic image reveals itself, different from the a-historicity of the matrix of the digital image consisting of pixels; still a lot of technical effort (and electric energy) is needed in order to keep these pixels steady, unlike the photographic film which offers a moving image while running, but is in its individual photochemical components is static and steady image frames. The very term *videocity* is a conceptual analogy to *electricity* – not only on the surface but through an inherent logic; electricity is the prerequisite of the processual video image - rather *flow* than "image".

Is video an original memory medium?

The instruction manual of the once colossal Video-Cassette-Recorder by Grundig BK 3000 COLOR proudly declares: "With this set you can record and play back colour as well as black-and-white television programmes at anytime. The timer and the integrated receiver enables you to record programmes even when you are not at home or while watching a different channel." Video recording is uncoupling the alliance between memory and space; the *loci memoriae* in the ancient rhetorical *Art of Memory* (Frances Yates) become literally metaphorical, i.e. transferable. Volatile TV-image lines, by magnetic recording, are endowed with an *operative* memory, allowing for syn- and

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[156] See Angela Melitopoulos video and text: Timescapes, in: Lab. Jahrbuch 1996/97 für Künste und Apparate, edited by Academy of Media Arts, Cologne (König) 1997, 173-183

diachronic time axis manipulation; the tape can be erased and re-recorded anytime, as had been known from audio tape recording previously, for the simple (media-archaeological) reason that one-dimensional, therefore linear audio signals are technically easier to handle in signal processing than the two-dimensional image. Analogue electronic imaging actually applied "audio" techniques like the successive scan line.

On the magnetic video tape, new recordings automatically erase the old, while the electronic hardware itself is a con-temporary layer of different technical layers, ranging from the typewriter-like keys of operate the machine ("Play", "Pause", "FF / Rewind") over the dynamo motor driving the reels up to the deleciate electronics of the thermionic tubes or transistors, finally focused on the arche-typal scene of frequency-based technical media: the electro-magnet induction unfolding between the recording tape and the coil within the reading / writing / erasing head(s) of the machine. Old recordings are even erasable without recording any new content: "For this push the record button while disconnecting the aerial cable. Now you are recording only interferences (so-called 'semolia')." Therefore erasing is not nothing, but an inverted *signal-to-noise ratio*.

"Erasing" is a practice which has continued from magnetic recording devices up to the notorious Hard Disc drive for computer memory. But the concept of erasing as overwriting is deceiving in terms of what actually occurs with the signals on the material level. For a mathematicized electronic order, a "deleted" data file (for saving memory space) only erases the storage place address, that is the metadata, while the "content" itself remains scattered over the sections of the magnetic disc. Matthew Kirschenbaum has revealed, in detail, the "forensic" possibilities to recoder apparently erased data - the electro-magnetic logic of the palimpsest, most familiar to a textual scholar. Only the brute force of the "Purge" command once actually erased (almost) all data traces from a disc.

Sampling scanner convert the analogue video signal into a digital one to make it processable by computer software, while analogous video is restricted to a merely external attribution of temporal memory adressing. The pre-digital *time code* has been external to signal storage media; the counter served to find particular places on the tape in contrast to the *immediate time code* within the image, by which any element of the image itself becomes discretely addressable. The time of the memory function is that of time made stand still. "Stills" in time-based media however produce disturbances. The phenomenally aparent "flow of time" and the tempoReal of the video signal become technically integrated into the symbolic order of cultural time, by the very discrete keys of accessing the storage tape - like continuous oral speech since alphabetic writing, or type-writing, finally: the turingmachine "tape" operations *alias* digital computing.

Aesthetics of Disturbance: Let there be (video) noise

Only in the moment of technical disturbance the time-based character of the video image is revealed to human perception in its contrast to the static, fixed photographic film still. This eventality is not simply content-based any more but

a medium-specific tempor(e)ality. For the case of video, this is obvious in the moment of activating the "Pause" button while playing a video: the video image does not stand still; unlike the film still, it is an image that has to be permanently *refreshed* in order to become visible for the human eye. It is no photography, but a time signal.

Videocity is disclosed in the very moment of break-downs of the image on the monitor screen: Then video becomes "present-at-hand" in Heidegger's sense, making the acoustical and optical humming and disturbance a subject of theoretical and aesthetic reflection. Such micro-traumatic moments are no longer derived from an personally experience, but formed in a techno-constructivistic way. All the difference between analog signal distortion and the digital "artifact" which arises from unintended alteration of data in the process of compression or other algorithmic transformations; only superficially this may be compared to the memory distortions identified for humans by neuroscience and psychanalysis.

Eric Siegel once reminded of the electro-magnetic fields as the true essence of the video "image" by moving a magnet across the electronic TV tube, distorting the image without damaging the set.[157] Disturbance is the essence of electronics, and the simultaneous humming noise of the electronic image is its distinctive feature. In the technical sense disturbances do not occur as irritations on the screen but disclose the nature of transmission itself. Media Archaeology is about such dis/continuities in the very precise engineering sense. According to *http://experimentaltvcenter.org/video-terms*, "noise" is any unwanted signal present in the total signal. But what if noise is part of the media-artistic intention itself, like in Bill Viola's video called *Information* (1973)? The signal-to-noise ratio (S/N), as defined in communication engineering (Claude Shannon), refers to the proportion of desired audio and video information to undesired signals (which still might become aesthetic "information"). And on the most basic media archaeological layer of video art works, the chemical vinegar syndrome refers to the decomposition of an acetate based magnetic tape. It results in a faster loss of the backing, or in so-called "crosstalk" and "print through", the interference of the taped signal by another signal, resulting in distortion of the image or sound. This can occur if signals on the tape imprint themselves onto nearby areas of the tape without artistic intention. It is most noticeable on audio recordings; one may be able to faintly hear a ghost of the other unwanted signal when the tape is played back.[158]

Bill Viola's definition of the electronic image as "sound" of one-line scanning"[159]

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[157] On Shamberg & Raindance Corporation, Guerilla Television, 1971, see Ina Blom, The Autobiography of Video, xxx

[158] See Amia Videotape Preservation Fact Sheets, authors: Jim Wheeler and Peter Brothers, editor: Hannah Frost for the Amia Preservation Comittee, 2002; http://www.amianet.org/publication/resources/guidelines/videofacts/about.html

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

once unintentionally resulted from such laboratory signal-eventality. His videotape *Information* (1974, color, sound, 30') has been "the manifestation of an aberrrant electronic nonsignal passing through the video switcher in a normal color TV studio, and being retrieved at varous points along its path. It is the result of a technical mistake made while working in the studio ...When the record button was pressed, the machine tried to record itself. The resulting electronic perturbations affected everything else in the studio: ... there was sound where there was no audio connected ... After this error was discovered and traced back, it became possible to sit at the switcher as if it were a musical instrument and learn to 'play' this nonsignal. Once the basic parameters were understood, a second videotape recorder was used to record the result. *Information* is that tape."[160] Implicitely, the title *Information* anticipates the digital image which actually measures aesthetic value in binary information units: neg/entropy.

Digital post-media archaeology?

Media Archaeology, even when applied by non-engineers, tries to get as close as possible to a technological understanding of media artefacts like video; different from specialists, its skill is to identify the technical details which are salient in terms of epistemological surplus. The transformation of the video time signal into the discretely computable frequency domain deserves going deeper into its variances and details; from here, Media Archaeology links to the philosophy of time itself. Instead of storing and processing every single video frame, time itself actually disappears (*idealiter*) with algorithmic sound and image compression.[161]

If the term "image" still makes sense for the photographic frame in cinematography, it has already become problematic with the sequential lines of electronic television and its interlacing of halb-frames. With digital data transmission, even if still conceptual based on the frame of the image, the "image" operationally dissolves. Computing culture asks for new terminology which is offered by signal processing theory in physical and theoretical informatics indeed.

The current online media option to watch "streaming video" such as on the Youtube channel heavily relies on efficient digital image compression and their codecs; the MPEG standard is a sequence of frames no more, but after sampling one conventional key frame the algorith calculats only the partial differences arising in the follwing film frames, anticipating the immediate data future by by predictive coding, operated on wavelet analysis and pixel values entropy. Mathematician George Birkhoff once defined the "aesthetic measure" for paintings and other random patterns as a ratio between order and complexity, and those works deemed to be most satisfactory had a proportionately highest degree of symmetry to the number of angles, curves,

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[160] Bill Viola, as quoted in: Bill Viola. Installations and Videotapes, ed. Barbara London, New York (The Museum of Modern Art) 1987, 24

[161] Strutz 2005: 218: "Die zeitliche Korrelation wird durch prädiktive Techniken vermindert."

or irregular forms flowing from one to another.[162] Subsequent cybernetic information aesthetics (Abraham Moles, Max Bense) defined the preditability and degree of redundancy in images, texts, or musical compositions, is actually operated actively by compression algorithms. Video compression techniques reduce the spatial redundancy among the picture elements and the temporal redundancy between successive frames, indeed, by interframe coding.[163] *Predictive coding* and *delta* compression result in a micro-temporal diagram which is no time "window" of the present moment any more (as equivalent to "frame" and optical perspective) but rather a time-critical cascade.

One method of transmitting iconic messages is transmiting, in their place, sequences of symbols.[164] Such micro-temporal operations have become an agency in contemporary media communication in the form of Streaming Video which heavily depends on high compressability of series of images. Digital video compression is in fact a delicate temporal operation based on micro-archival operations; only parts and sections of the image are updated at a temporal moment. MPEG technologies for video compression transform the plenitude of movement into partial sampling. Each frame is divided into smaller blocks of pixels in order to analyze changes from one frame to the next. A group of frames is thereby established around one initial key frame at interpolative intervals. On that basis, probabilistic calculation predicts the location of each block of pixels. Movement takes place through updates of certain sections of the image, while the rest of the frame is replayed as before.[165] Such *delta* compression in video computer graphics is technological chronopoetics, with severe consequences for what used to be "cultural tradition". Lossy image compression in digital conversion of analog video tapes to DVD, as a practice in non-archival preservation, makes sense in terms of storage space economy, but leads to non-restorable signals which require interpolation.[166] The preservation philosophy oscillates between restoring the tape *versus* restoring the recording.[167]

Beyond the traditional inventory for textual records, this opens options for movement research based on the moving image from within, suitable in terms of true media-archaeological analysis. Film cuts, for example, are easily traceable because they can be coded as video compression picture types

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[162] See Jasia Reichardt, in: Paul Brown, Charlie Gere, Nicholas Lambert, and Catherine Mason (eds.), White Heat Cold Logic: British Computer Art 1960 - 1980, Cambridge, MA (MIT Press) 20xx, 85

[163] Tomas Fryza, A Complete Video Coding Chain Based on Multi-Dimensional Discrete Cosine Transform, in: Radioengineering vol. 19, no. 3, September 2010, 421-428 (421)

[164] David A. Huffman, A Method for the Construction of Minimum-Redundancy Codes, in: Proceedings of the I.R.E. (September 1952), 1098-1101 (1098)

[165] See Trond Lundemo, In the Kingdom of Shadows. Cinematic Movement and Its Digital Ghost, in: Pelle Snickars and Patrick Vonderau (eds.), The YouTube Reader, Stockholm (National Library of Sweden) 2008, 314-329 (316 f.)

[166] See Memoriav (ed.), Memoriav Empfehlungen Video, Bern, February 2006. Editing: Felix Rauh

[167] See Sherry Miller Hocking / Mona Jiminez, Video Preservation - The Basics (2000)

(MPEG). In algorithmicized hermeneutics, is possible to navigate through large amounts of moving images beyond verbal language, in an im-mediate access to images, unfiltered by words. Media philosopher Vilém Flusser once defined *telematics* as the convergence of images and telecommunications, "so new that we experience it as a technical phenomenon and not yet as a cultural one. This is why we speak of things like lasers, cables, satellites, digital transmission, and computer language as if only technicians should speak of such things."[168] From the media-archeaological perspective, such *termini technici* shall resist being absorbed and replaced into more discursive terms. In order to be more precise in describing time-critical processes (in the double sense) resultng from within technologies instead of subjecting them to a totalizing signified called "time", engineering terms actually help to liberate conservative cultural consciousness from the specter of "time".

Media themselves as archaeologists: archaic video recording

Media archaeology aims at an *archaic* media experience: a "rarification" of discourse (Foucault). This is not a simplification, but a conscious analytical reduction to techno-logical essentials and *principles* (the Latin equivalent to *arché*). Media Archaeology therefore looks at the moments of technological emergency not in terms of historicism, but because technological structures become evident in their beginnings: "It is the beginnings of invented things, which appeal to me", writes Lance Sieveking (who wrote one of the first televisoin dramas transmitted by the BBC), and explains: "For it is at their beginnings, that we may detect their true nature", that is: their epistemological essentials. Sieveking is quoted as the *motto* of the memoirs of John Logie Baird *Television and Me*[169], which provides for a very archaeological insight into first steps of the electro-mechanical television apparatus indeed. "In principle, the *televisor* is both simple and ingenious", comments the brochure accompanying the model kit *The Televisor* , developed as teaching device by the Meddlesex University.[170]

What developed into mass media later, has originally been developed for analysis, as measuring or storage devices in experimental research - which is the case for the Edison phonograph (preeceded by Scott's phonautograph, created to register the frequencies of the human voice for analytic purposes, before it was reversed into synthesis in replay), the kinematograph (preceded by chrono-photography), radio (Hertz' Karlsruhe experimental verification of Maxwell's mathematical equations on electro-magnetic wave propagation) and the television tube was developed out of a measuring device, Ferdinand Braun's electronic oscilloscope. The oscilloscope itself, such as the TV tube which only metaphorically survives in the YouTube video channel. is a sub-class of the thermionic tube which functionally (if not historically) endures in transistors and the highly Integrated Circuits within microprocessors, and

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[168] Vilém Flusser, Into the Universe of Technical Images, Minneapolis (University of Minnesota Press) 2011, 80 (initial quote in: Ricardo Cedeño Montaña, Portable Moving Images. A Media History of Storage Formats, "Introduction", 1-19, New York (de Gruyter Arts) 2017
[169] Edited by Malcolm Baird, Edinburgh (mercatorpress) 2004
[170] www.mutr.co.uk

appeared on the media-theatrical scence even before humans could apprehend it: Edison, when experimenting with an improvement of his evacuated light bulb, incidently came across what became known as "Edison effect", which the inventor got patented without being able to explain the event - the thermionic tube as diode, emanating in a glimmering shadow on on the inner glas surface, kind of non-semantic anticipation of the electronic image. In fact, the first fully electronic device for storing a literal "bit" has been the flipflop circuitry, consting of two interlaced triode tubes - therefore "analogue" electronics returns from within "the digital".

Between the phenomenological surface of media (such as the proverbial television "tube") and their concealed *arché* opens a dramatic gap. Technological media are non-discursive formations which can rather be addressed in technomathematical terms. Media archaeology performs a micro-epistemology, that is: disovering, analysing and describing the epistemological sparks which spring from the most concrete level of technology itself, such as the delicate electronic saw-tooth signal generator) which creates the jumps of single cathode ray lines within a television set in order to create the impression of an electronic image for always belated human perception at all.[171]

Archaeology in Foucauldeans terms deals with enunciations; this is what is *not* immediately visible, rather geno- than phenotextual. A photograph of an early television set such as the 630-TS fabricated by RCA company[172] actually does not show a medium, not even a "dead" one, but a technical sculpture, since it lacks its essential medium definition: signal processing. The tube (mostly for museological preservation reasons, and obsolete communication engineering standards) remains empty here.

In terms of television studies, the 630-TS may have been among the first mass-sold television sets in the US (1946), but this is already the moment when the media-archaeological incubation epoque of its technology ends. Media Archaeology rather concentrates on the emergent prototypes such as John Logie Baird's electro-mechanic, Nikow-disc driven *Televisor* in the 1930s. At the beginning of Donald McLean's functional signal reenactment of early 30-line television image recording (resulting in his monography with the telling title *Restoring Baird's Image*) has been the misunderstanding of gramophone records in the archives of the BBC. Put on the turntable, it produced no musical sound; attached to the oscilloscope, figurative patterns took shape and suggested an archaic line-by-line television recording, media-archaeologically recalling Bill Viola's definition of the electronic image as the "sound of one-line-scanning", closer to the unfolding of sound from the grooves of a phonographic record than to the photographic or film image

Sonification of the electronic image in fact has once served as a media-archaeological, that is: analytic tool. Baird reports about his experiments to enhance the luminosity of his early television images. In testing out the amplifiers, he used headphones and listened to the noise of the vision signal

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[171] See A. J. Klopow, Grundlagen der Fernsehtechnik, transl. and supplemented by P. Neidhardt, foreword Manfred v. Ardenne, Berlin (VEB Verlag Technik) 1956, chapter 5 (50-99)
[172] See Radio Museum website; http://www.earlytelevision.org/rca_630.html

made: "I became very expert in this and could even tell roughly what was being televised by the sound it made. I knew, for example, whether is was the dummy's head or a human face. I could tell when the person moved, I could dinstinguish a hand from a pair of scissors of a matchbox, and even when two or three people had different appearances I could even tell one from the other by the sound of their faces. I got a gramophone record made of these sounds and found that by laying this with an electrial pic-up, and feeding the signal back to a television receiver I could reproduce the original scne. <...> If the cinema had never been invented the 'Phonovisor', as I christened the device, might have been worth developing; it was certainly an intriguing process. Vision into sound and sound back into vision."[173]

But only by the intermediary retroactive application of specially written filter software, i. e. by digital processing of the damaged signals, could such original grammophonical recordings be "restored". It is not the original recording which is replayed, but an algorithmicised re-enactment.

What the computer screen seems to re-play, is not the original recording, but an re-enactment, a digitally sampled and processed emulation of 30-line electro-magentic vintage television. What sampling (according to the Nyquist / Shannon theorem) can achieve is the "faithful" reproduction of the electro-physically "analog" signal in high fidelity. This is logical modeling; what it can not achieve, though, is the truly co-original re-generation of the television signal amplitudes derived from photo cell-based linear electronics.

Once again, Media Archaeology as practice-based research reveals its double sense of techno/logy: on the one hand it is about restoring the materiality of mechanical or electronic devices, but in order to restore the signals, it nowadays deals with mathematized meta-realities as well. Computers and algorithms themselves here become active media archaeologists.

McLean describes the metamorphosis of time signal into timeless information once it has been sampled: "The signal is now digital and is the starting point for digital signal and image processing" (ibid.). "Line by line, the correction values plot out the profile of errors in the signal's timing."[174]

In such a moment media archaeology is not just a method of human media studies any more, but digital media themselves become the agency of technical reconnaissance below historical consciousness. "If it were not for computer technology, Baird's *grammophone videodiscs* would continue to be curiosities that merely hinted of a time before television as we know it. Their latent images would remain unseen and the information imbedded in them would still be compeltely unknown" (ibid.).

McLean heroically resists the classical archaeology metaphor: "Unlike traditional archaeology, the artefacts are not embedded in layers of history but have existed in both private and public collections, largely ignored as

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[173] Television and Me. The Memoirs of John Logie Baird, ed. Malcolm Baird, Edinburgh (mercatpress) 2004, 64 f.
[174] McLean 2000: 93

curiosities"[175]; media time is time of latency. Therefore, Baird's *Phonovision* is not a "dead medium" (in Bruce Sterling's sense), but an aggregation, wainting to be re-processed in order to become a true medium (in operation) again.

Another case of "re-presencing" early television recording is the picture disc which has been attached to the Voyager satellite for future communication with extra-terrestrial intelligence. It has been an anachronism already in the moment of its launch into space in the 1970s. As a technological rebirth of early scan-line TV image recording the picture disc demonstrates that media archaeology is not necessarily about the past but as well describes a recent (and ongoing) present.

A split approach is required for a successful analysis of the techno-phenomenon of 30-line television: both in historical (contextualizing) terms (Science and Technology Studies) *and* in media-archaeological terms (as literally object-oriented research, allowing for its material / logical "vetos"), resisting the historiographic quest for "coherency" (the metahistorical "emplotment", according to Hayden White). The very nature of technological objects necessary creates a dis-continuity between human (narrative) and nonhuman (artefacts) point of view, to which Bruno Latour, in his "Actor Network Theory", paid attention.

Correcting the time base: non-human video tempor(e)alities

No technological analysis is complete unless its appropriate time-concept is included; therefore, *media* archaeology is concerned with techologies not only on their (infra-)structural but as well on their *operative* level. With a signal being the physical representation of a message respectively information, any electronic media event is a function of time signals ("Zeitfunktionen der Signale"[176]) - an existential temporal form which, in this case, coincides with the technological act of induction itself.[177] The distortion of the images resulting from its scan lines - very different from the logics and "artefacts" of algorithmic image compression - brings out the "analog".

The emerging technologies of time control in the 1970s have been the *a priori* of video-specific temporalities[178]; indeed this video-temporal aesthetic can not be explained in terms of social or economic trends any more (like "portable TV production"). Siegfried Zielinski's writings on video accentuate how its application to television resulted in "time souvereignty" against the pre-scheduled TV programs both for producers and consumers. But this concerns its social use, while time-critical media-archaeological analysis of video goes directly into its technology.

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[175] McLean 2000: xvi

[176] Karl Küpfmüller, Die Systemtheorie der elektrischen Nachrichtenübertragung, Stuttgart (Hirzel) 1974, 393

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

[178] Ina Blom, The Autobiography of Video. The Life and Times of a Memory Technology, Berlin (Sternberg Press) 2016, chap. 5

Video-technical micro-temporalities irritate the human temporal sense. Difficult, of course, is the dilemma which faces all textual analysis of video and related works. Ekphrastic descriptions of single works in minute detail leave readers unconfortable, since they can not control the description against the signal event. Photographic video stills can not make up for the physiological effect of moving electronic scan-line images. How can the micro-movements described in time-critical analysis ever be caught in textual description - a dilemma which faces all textual studies of time-based and time-critical media. The alternative is to "write" videocity in its own medium - just like Jean-Luc Godard's *Histoire(s) du cinema*.

Obvisously, terms like "video mind", "video life", "autobiography of video" in Blom's monography are not meant in a metaphorical sense; the real message is the insistance of the cybernetic concept of a generative aesthetics which equally pervades (as expressed by Norbert Wiener) human *and* machine systems when it comes to temporal signal processing. As expressed in the "video times" chapter, the "availability of new and more precise technologies of time control during last half of the 1970's (dynamic tracking, digital time code editing, time base correctors etc.)" opened access to a non-biologistic, bodyless experimentation with electronic "live" (instead of "life") signals, discovering genuinely chrono-poetic media tempor(e)alities.[179] The electronic emphasis on time control de-metaphorized anthropomorphic models like "video life". Tracing the *technical* "individuation" of a specific video aesthetics in the 1960s and 70's[180], even Bill Viola's mysticism becomes a function of "brain-like" electronic technologies (cybernetic neurological research). Theefore the use of the term "autobiography" for a technological device is rather counter-narrative; the crisis of narrative culture is itself media-induced. The media-archaeological point of view, defending the "non-human rights" of technological achievements such as electronic video, de-metaphorizes the term "life" which comes with all the many quasi-biologist associations which has been attached to early video by the media artists themselves in the late 1960's / early 1970's; in terms of cybernetics, it is all signal transduction and signal "processing" - in the animal and in the machine, equally.[181]

Applied media archaeology: video art preservation

Despite the theoretical objection against the archaeological metaphor for media-archaeological analysis, there is an "archaeological" aspect of media culture in the more traditional sense indeed. Adopting to the techno-logical time regime, the core decision for media art museums is between preservation of aesthetic content vs. preservation of technological form, as has been discussed for the cultural heritage of a century of cinematography already. In

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[179] See Wulf Herzogenrath, Der Fernseher als Objekt: Videokunst und Videoskulptur in vier Jahrzehnten, 110-123, in: same author (ed.), TV-Kultur, Dresden 1997

[180] In the sense of Gilbert Simondon, Du Mode d'Existence des Objets Techniques, Paris (Aubier) 1958

[181] Norbert Wiener, Cybernetics or control and communication in the animal and the machine, 1948

the phenomenological, content-focused perspective on media art, "[t]he material experience of film is neither celluloid nor its electronic variants as magnetic tapes or circuits, but rather the flow of light that reaches our eyes"[182]. But the aesthetic message comes from within the technological structure of the work itself. Technical vulnerability is not an external threat but an essential feature of "enduring" media-artistic articulation.

When Ampex company introduced the video image tape recording in April 1956, it was not meant as an enduring memory device. In the Platonic sense of media critique of alphabet writing, it is obvious that (like writing on a wax tablet) its real message is oblivion, since it allows for the immediate erasure and over-writing of the recorded signals. A straightforward strategy for electronic image preservation has been filming it on celluloid from the monitor. The media-archaeologically formative times of television broadcast technology just knew "live" transmission; the Marconi Company (GB, 1957) developed the Marconi Telerecording, a recording from screen by film camera with fast intermittent mechanism, while sound was recorded on a sychronized tape recorder with perforated recording material (double tape). But parallel to this kind of "iconic" documentation, it is mandatory to preserve the circuitry diagrams of electronic media art, which were explicit in the hard-wired "scores" of David Tudor's electro-acoustics at the *Nine Evenings* in New York, 1969 - towards an archive of operative diagrams.

David Claerbout's video projection *Ruurlo, Bocurloscheweg, 1910* [183] takes its departure from an ancient postcard but delicately "animates" the leaves on the central tree in this landscape image. Long-time preservation of such a video installation requires the most precise time-base correction of the electronic image lines. The time base corrector has been the moment when the "digital" entered the otherwise analog television and video production those years (just like Erkki Kurenniemi's digital control mechanism of electronic music synthesizers in Helsinki in the 1970s). The TBC, developed esp. for colour signal correction, is a delay-line and master-clock (sync genrator) based digital device for intermediary buffering and feeding back image frames, with the delay interval (delta-t) ranging between zero millisecond and the length of one complete frame. Distortions of the electronic image derive from mechanical friction in analog videocassette recorders. Video preservation is not only about maintaining a cultural object across generations, but about preserving the technological time object itself.

There is even a media-ecological aspect of energetic cooling systems for video tape preservation; the cultural impact of the museum, especially the preservation and memory of media art, can be sustained only through the materialities and energy costs of its own "media" infrastructure, resulting in a trade-off between thermodynamic and informational entropy which has to be renegotiated again and again.[184] But this is not a "deep" temporal extension,

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[182] Barbara Flückiger, Material properties of historicla film in the digital age, in: NECSUS. European Journal of Media Studies 2012: 3; www.necsus-ejms.org/material-properties-of-historical-film-in the-digital age

[183] 1997, no sound, s/w, 60' loop; see https://vimeo.com/171214749 (accessed December 1, 2017)

[184] See Samir Bhowmik (Media Lab, Aalto University School of Arts, Design &

but a radically challenging presence, the most actual manifestation of media archaeology.

II ON ICONICITY (notes):

The "cold gaze": Media archaeology in alliance with the photography

- camera lens capable of freezing the moment of danger, enframing the traumatic shock in a manageable format; for Ernst Jünger, optical technology creates an almost Nietzschean aesthetic of detachment [...]; thus the photograph "<...> stands outside the realm of sensibility. It has something of a telescopic quality: one can tell that the object photographed was seen by an insensitive and invulnerable eye. The eye registers equally well a bullet in midair or the moments in which a man is torn apart by an explosion"[185] = chronophotographical indifference; photographic and cinematographic "freeze" images corresponds with the literally *theoretical* "cool" archaeological gaze

- "frozen" condition not just a physical state but a theoretical aesthetic in itself; corresponds with the photographic "shot", the *freezing* of its moving object in a temporal slice / moment

- a technical medium, unless in operation (under current), in a cold state of latency

- insistence on the mechanical or electronic or algorithmic "eye", the cold gaze, key to media archaeological approach; a "vision" of machinic agency; before a cultural historian tells stories about past media cultures, there is a prior level on which the past has been recorded; documents of the past are concrete instances of pasts-present, but even more so the way in which technical media records time and acts as a time-machine between current times and the past. This time-machine is non-hermeneutic; Kittler's claim: technical media do not record only meanings, but also noise, and the physicality of the world much outside our human intentions or signifying structures; for instance an old phonograph is the first media archaeologist before human intervention

- "Media archaeology executed through the epistemological figure of the 'cold gaze' is [...] a way of stepping outside a human perspective to the media epistemologically objective mode of registering the world outside human centred sensory perception."[186]

Architecture Finland), Deep Time of the Museum: The Materiality of Media Infrastructures, doctoral dissertation, Aalto University, Helsinki (Aalto Art Books) 2016

[185] Ernst Jünger, Photography and the second consciousness, excerpt from: same author, On Pain, in: Photography in the Modern Era: European Documents and Critical Writings, 1913 / 1940, ed. C. Philips, New York (Aperture) 1989, 207-210 (208)

[186] Jussi Parikka, Archival Media Theory: An Introduction to Wolfgang Ernst's Media Archaeology, in: W. E., Digital Memory and the Archive, xxx, 1-21 (11)

Photography without the painterly hand

- liberating the artistic hand for more experimental drawing and painting as a non-realist art form; "the instrument chronicles whatever it sees, and certainly would delineate a chimney-pot or a chimney-sweeper with the same impartiality as it would the Apollo of Belvedere" = Henry Fox Talbot, The Pencil of Nature (1844), explanation to plate II *View of the Boulevards at Paris*; idem, Some Account of the Art of Photogenic Drawing, or, The Process by Which Natural Objects May Be Made to Delineate Themselves Without Aid of the Artist's Pencil, in: Photography. Essays and Images: Illustrated Readings in the History of Photography, ed. Beaumont Newhall, New York (The Museum of Modern Art) 1980), 23–31; Richard Beaudoin / Andrew Kania, A Musical Photograph?, in: The Journal of Aesthetics and Art Criticism, vol. xxx (2012), 115-127

- "the whole cabinet of a Virtuoso and collector of old China might be depicted on paper in little more time than it would take him to make a written inventory describing it in the usual way. The more strange and fantastic the forms of his old teapots, the more advantage in having their pictures given instead of their descriptions" = Talbot 1844

- truly media-archaeological moment, or rather: momentum. In the early days of photography, it took a long time interval for the object to get fixed by interaction of light and the silver grains on the photochemical carrier. For humans and other animals, this meant suspending any movement, almost: fossil like freezing during a portrait session, becoming a statue for a certain interval of exposure. Whoever nowadays, in the age of photographic clicks, undergoes this archaic experience in face of a Camera obscura, makes this experience of time itself passing as still - with the curious side-effect that in the background things happen which do not get inscribed like in the famous Daguerrotype of the Boulevard du Temple in Paris which looks empty except one human sitting in a chair to get his shoes polished

- project "Picturing Aura", a media archaeology of aura-imaging technologies / optical instruments (Jeremy Stolow, Montreal); Benjamin tracing the photogtraphic aura / spiritistic aura-tracing by photography itself; Wolfgang Hagen on "medium" fixation in early photography, separating photochemical noise from what appeared as mediumistic appearances

Historicism and the photographic archive (analogue times)

- while historical observation (and recording) tends to narrativize events, ultra-short photographic exposure reveals the accidental.[187] It is the contingent which short-time photography is able to catch with diminuishing time of exposure. The tempo-real can be catched this way which has escaped symbolic notation (historiography) so far

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[187] Dolf Sternberger, Über die Kunst der Fotografie, in: Wolfgang Kemp, Theorie der Fotografie, vol. II.: 1912-1945, München (Schirmer/Mosel) 1979, 228-240 (xxx)

- undoing historicity? photographic memory not immaterial but bound to a chemical storage medium. *Temporal* transcendence of materiality is a faculty of operative media technologies

- photography, understood with Roland Barthes' *La chambre claire* as a photonic emanation of an object, memorizes rays of light reflected by this very object to the viewer in the present - a delayed transfer of what otherwise vanishes into the dark; inscribes physical tempor(e)ality into the image, while computational imagery exorcises time parameter in favor of its mathematical / numerical, therefore: calculabe reverse, spectral frequencies; different from painting as cultural technique, algorithmically generated *imaging* (such as fractals) exclusively emerge within the machine, by-passing human vision: "Raytracing algorithms calculate paths and angles of light beams resulting in the pixel-by-pixel buildup of brilliant hyper realistic pictures; radiosity algorithms calculate diffuse reflections from various objects resulting in a growing luminosity within a given picture"; while mathematics involved in raytracing operates with laws of light reflection and refraction, radiosity based on cosine law formulated by Johann Heinrich Lambert's *Photometria* (1760) = Holl, in: DHQ

- light emission itself can be photographically sustained in the time channel of tradition; emphatic temporal distance as described by historiography shrinking to an affective moment of Benjaminesque *Jetztzeit*; the past flashes into the present

- photographic image characterized by the physical irreversibility of the inscribed photonic moment which authorizes its temporal indexicality; for the same reason any photography subject to another temporal destiny visibly known as chemical entropy

- temporal index not rooting in the imaginary "referent" of the photographic image (Barthes) but in the material irreversibility of the en-lightened photosensitive chemistry (argument Hagen, "Entropie"), fixed only in the moment of delevoping the negative; chemical photography irreversibily degrades in luminance; moment of exposure to light momentarily in-forms the negative in Heider's sense (medium / form, loose / tight coupling), crystallizing silver halegonite

- section of the medical film archive of Charité Hospital, Berlin, generated by a secret medical film project between 1941 and 1945, thrown by the SS into lake Stößensee near Berlin when the Red Army approached Berlin; divers detected these films in 1993; just three of several hundred film rolls could be deciphered at all, one of them showing on the basis of heavily damaged film material a naked man who performs several movements, apparently directed by orders from outside. "More cannot be seen" = Keller 2000

Photography, memory and the archive: Heidegger's distrust

- cultural objects in museum display: "World-withdrawal and world-decay can never be undone. The works are no longer the works they were. It is they themselves, to be sure, that we encounter there, but they themselves are gone

by" = Heidegger, Origin, 166

- Barthes' notion of the photographic *punctum* as experience of by-gone presence (*Dagewesenheit*)

- "If for Heidegger the *Gestell* appears as a kind of `photographic negative' of *Ereignis*, Benjamin insists that this negative imprint must be developed" = Rebecca Comay, Framing Redemption: Aura, Origin, Technology in Benjamin and Heidegger, in: Ethics and Danger. Essays on Heidegger and Contintental Thought, Arleen B. Dallery and Charles E. Scott (eds.), Albany (State Univ. of New York Press) 1992, 139-167 (161), referring to M. H., *Vier Seminare*, Frankfurt/M. (Klostermann) 1977, 104)

- as technological artefacts, images suspended from from cultural and humanistic categories, such as habitus, style. "For the historic index of the images doesn't simply say that they belong to a specific time, it says above all that they only enter into legibility [Lesbarkeit] at a specific time. And indeed this entering into legibility constitutes a specific critical point of the movement inside them. Every present is determined by those images that are synchronic with it: every Now is the Now of a specific recognizability [Erkennbarkeit]" = Gesammelte Schriften vol. 5 (Das Passagen-Werk) N 2a, 6 = p. 577, quoted in: Fynsk, 116; read the "entering into legibility" from the media-archaeological point of view as a non-discursive practice of machine reading; no metaphysics here, but algorithmic data administration; external metadata an archival texture exterior to the object, as opposed to deriving metadata from primary inscription within the digital image itself

Reverse temporal indexicality: The enduring photographic image

- inherent limits of photography which technically can always only be a snapshot / interval (Delta-*t*) of time - unless long-time exposure, like in the early days of photography and in Bragaglia's photo-dynamism, as well as in Ètienne-Jules Marey's serial chrono-photographical exposures; cinematography still composed of moving stills

- Hiroshi Sugimoto's long-time exposure in photography of a cinema film screening results in the screen as white square, resulting in kind of pure, non-semantic Bergsonean durée; temporal indexicality which is (in spite of its iconic content) the real medium message of photography hereby dissolves into the temporal interval itself - an aesthetic reverse engineering of the long exposure time in originary photography; Matthias Flügge u. a. (ed.), Raum. Orte der Kunst, Nürnberg (Verl. f. mod. Kunst) 2007, 304 ff.; Hiroshi Sugimoto, Time exposed, catalogue Kunsthalle Basel (1995), ed. Thomas Kellein, Stuttgart 1995

- different from cinematography which is not only in time but embodies a temporal extension in itself; inbetween: chronophotography

- long time exposition (the early temporality of the photogenic process) introduces times as (Bergsonean) endurance into the image, somewhat comparable to John Cage's composition of 4'33 minutes silence for piano

Chrono-photographic freezing

- Jules-Étienne Marey and Edweard Muybridge chrono-photographically transforming an otherwise temporally experienced sequence (movement) into a spatial series (of discrete moments), close to the present aesthetics of the animated GIF; even if cinematographic montage manipulates / deconstructs the linear time axis, its elementary units still consist of temporal (sequential) objects; linear time is its matter

- comparing photographic moment, i. e. the fixation of a moment in time, to 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 Δt (even if it tends to zero). The media archaeology of photography itself reveals how the long-time, almost painterly exposure of early Daguerreotypes and Talbotypes by progressing mechanical and chemical means shrinked down to the notable photographic "click" or "shot". On the other hand, it can happen that a photographic negative film is being developed months or even years later, such as in the tragic case when two rolls of film were found next to the corpse of Robert Falcon Scott who died with his team on the way back from the South Pole in 1912 after having only been second to Roald Amundsen. The author of *The Great White South*, Herbert Ponting, a photographer and who previously had accompanied Scott in the Antarctic, had the film developed (= signal memory), while a letter (= symbolic memory) which Scott had found in Amundsen's former tent at the South Pole and carried with him until his untimely death, was uncovered from snow (the medium of oblivion and frozen memory) as well and finally posted to its adressed destination: H. M. King Haakon of Norway.[188] The timing of photographic immediacy and postal deferral, otherwise clearly alternative to each other in its temprality, here interfere, being subverted upside down. Scott from the developed photography still looks at us (the Barthesian *punctum*) as if it was a live transmission, televised from the past - chronotelevision, cutting short and undermining what is cognitively (*studium*) known to us as the historical distance which separates us from that past moment, based on the symbolic regime of historiography (letters)[189]

Between analog and digital (non-)temporality: the photographic snap shot as temp"aural" moment

- very term photography itself becoming antiquated in the digital age, where the analogue "writing of light" (records) has been replaced by numerical "computing" of photonic energy transduced to binary information. While photo-*graphy* technically fulfills Derrida's criterium of the belatedness ("*différance*") of (hand-)writing[190], digital photography rather belongs to Gutenberg Galaxy

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[188] See "Letter from the South Pole", in: Living Memory, Oslo (National Library of Norway) 2006, 67

[189] Vigdis Moe Skarstein / Tinje Grave 2006: 67

[190] See Bernard Stiegler, Verkehrte Aufzeichnungen und photographische Wiedergabe, in: Michael Wetzel / Jean-Michel Rabatè (eds.), Ethik der Gabe.

(McLuhan) of typography

- notion of "space" itself derives from Latin *spatium* which names the interval; can be of geometrical or temporal extension; in room acoustics a function of the signal run time difference. With the shrinking of the temporal interval of processing a photographic negative in digital instantaneity, the sense of history is indirectly affected as well: no more *Entwicklung*

- with almost immediate non-storage of received photographies, emphasis of Barthesean "ca a été"[191] dissolving as well

- lamenting loss of "aura" (such as watching the shadow of a tree branch passing by in the progressive sunlight) by photographical image reproduction = Walter Benjamin, Kleine Geschichte der Photographie, in: same author, Medienästhetische Schriften, Frankfurt/M. 2002, 309; chrono-scenario takes a lot of time, contrary to its instant photography which would rather result in a series of snapshorts in chrono-photographical aesthetics; Benjamins description equals gnomon of the ancient sun dial which is an anlog time measuring medium par excellence, different from the digital clock

- the more precise the photographic snap-shot ("still") has become in the time-critical sense, the more it dord not confirm but irritate the human perception of the present which physiologically and neurologically rather embraces an interval of around three seconds. The numerical sampling of the present (which Henri Bergson and Martin Heidegger already criticized as "mathematical time" of cinematography and the oscillating clock) de-anthropologizes the present moment. The technical "instant" itself has becomme fuzzy. The aesthetic equivalent of this micro-temporal irritations is the photograpic flicker, as expressed in Anton Stankowski's photography of a passing car (1929). In a kind of representational oxymoron, speed itself becomes the message of the photographic still. What had been a deficiency in early photography - the comparatively long time of exposition required to produce a Daguerreotype - has (after the mastering of that problem by Talbot's Gelatine kallotype) returned as a chrono-aesthetic message; Berlinische Galerie exhibition *Sprung in die Zeit. Bewegung und Zeit als Gestaltungsprinzipien in der Photographie*, Martin-Gropius-Bau, Berlin (1992)

The animated photograph: *Blade Runner*, Claerbout

- Ridley Scott's film *Blade Runner* (USA 1982, based on the novel *Do Androids dream of Electric Sheep?* by Philip Dick), epistemology of the so-called Turing test: How long does it take for humans do differentiate androids from full humans. In its most advanced version (the "Nexus-6" series), the replicants are infused with memories derived from (other) humans. In the first private scene between Deckard and Rachael, she carries a photograph claiming that this shows her as a young child with her mother. Deckard reflects on the function of such photographies in infusing replicants with memory - not in the sense of

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Denken nach Jacques Derrida, Berlin (Akademie-Verl.) 1993, 193-210

[191] Roland Barthes, La chambre claire. Notes sur la photographie, Paris (Gallimard / Seuil) 1980

simple data storage, but in way closer to G. W. Hegel's differentiation between mechanical memory and internalized remembrance (Deckard, in the German translation, speaks of "Erinnerung"). *Erinnerung* is a quality which differentiates computer memory from human skills of digesting perception into recall. When she wants to know if she is a replicant, Deckard tells her a scene from her most intimate memory to proove that her remembrance is an implantat. Finally, Rachel throws the mother-and-child photography on the table and leaves. A minute later, when Deckard takes a closer look at that photography, shadows slightly move across the surface, subtly suggesting an animated picture (familiar from the "Ken Burns effect") which is a dynamic index to the temporal real - as if his own "living" memory was stimulated or he himself was reminded that he might be a replicant himself - questioning the difference between remembrance and technical memory.

- digitally animated photographs by David Claerbout (as presented in his gallery exhibition *Still (not) moving* = January / February 2014, gallery EIGEN + ART Lab, Berlin; blur the difference between the present and the past, and evokes the notion of the *undead*; a "post-digital" tempor(e)ality is evoked

- in "Director's cut" version of *Blade Runner*, a different photography turns up, once more supposed to show a childhood memory of the human/replicant, in fact a house garden scene. At one point in the close-up zoom on this photography, the leaves in the garden tree on the supposed memory photography of Rachel's youth slightly move which is a dynamic index to the temporal real / Siegfried Kracauer, *Theory of Film*, exemplifying the scene of rain drops falling on ground; leads to irritations of human confidence into the clear distinguishability of artificial and human memory

- further irritation resulting from film-making at work: both the main actor of the Blade Runner and his antagonists, the Replicants, have been enacted by indifferently humans in the 1982 version

- shivering of the leaves on the photographic still (its "still movement") in the Raquel memory *Einstellung* itself no more moving than the shown photograph; both composed of still frame sequences from within the cinematographical apparatus

- in phenomenological terms, a digital photography of a media-archaeological artefact and a movie of the same artefact look the same, but chrono-ontologically they embody totally different essentialities. A further difference is the filming of photography as opposed to the photographic print itself: The print endures, while is cinematographical recording passes both *in* and *with* time

Material chronophotography: The symbolic de-construction of a mechanism

- *Owners Workshop Manual* for the YUGO / Zastava car[192] itself a real "paper machine" (Turing), allowing to deconstruct and to reconstruct a Yugo car from

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[192] Somerset (Haynes Publishing Group), 2nd ed. 1990

scratch (esp. the 45 A series). The diagrammatic algorithm of the manual is convincing: "The tasks are described and photographed in a step-by-step sequence so that even a novice can do the work" - which is chronophotography in the best pre-cinematographic tradition of Marey and Muybridge" (p. 5). And the cover has a jacket comment on the series: "Every Manual based on a complete Stripdown and rebuild"

From natural movement to the un-natural in its chrono-photographic reproduction

- *temporal* quality of the "analogue"; time-continuous signal which differs from the "digital" time-discrete impulse. Mechanical cinematography has always already been dissimulating its digitality in a quasi-analogous perception by the lazy human optical apparatus, with the effect of "natural" reproduction of movement. The audience once reacted to Eadweard Muybridge's chrono-photographical analysis of movement with reservation: It was perceived as un-natural = `Zglinicki 1979: 176`; unease later philosophically expressed by Henri Bergson who defined the cinematographic movement as the false impression of time

- has chrono-photography, in traditional media historiography, been reduced to a mere fore-runner of the moving image, but chrono-photography the immediate precursor of digital sampling in an chrono-epistemological sense: an alternative to the linear continuum of historiographical time; correlates with sonic operations (Gabor's "acoustic quanta" as sampling wave forms on film stripe into "grains" for resynthesis as time-stretching; asymmetry between continuous sound and discrete image inscription on celluloid

- chapter four in Bergson's L´Évolution créatrice: cinematography nothing but a false simulacrum of movement, since what is un-rolled is frozen momentary images. According to Bergson, "true movement is between static states and is not their simple accumulation. [...] Hence, for Bergson, there is no such thing as the present" = Mary Ann Doane, Has Time Become Space?, in: Liv Hausken (ed.) 2013, 89-108 (94); in Bergson's sense, what human mind conceptually terms "the present" rather reminds of Heinrich Hertz' definition of "inner delusions" ("innere Scheinbilder") of a temporal reality.[193] By analogy Bergson describes human cognition as analytic operation, which according to McLuhan's diagnosis has been induced by the alphabetic discretization of continuous speech since antiquity.[194] All of the sudden, cinematography around 1900 is the return (even "recursion") of the alphabetic implication. The analytic approach (discretisation) which is mirrored by the Weber brothers' measuring of human petal movement and chronophotography (and in Reuleaux' Kinematik) then transfigures into synthetic projection: "movies". This is a media-epistemological transsubstantiation (to borrow a Christian term)

- Bergson describing the clock-movement in quasi cinematographical terms; in fact in the camera-projector constructed by the Lumière brothers, the perforated film is being driven by a clock-like mechanism. Dis/continuity (with

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[193] Heinrich Hertz, Mechanik, xxx
[194] McLuhan 1964/1994, 238

the slash signifying cinemato-graphic cut) the very essence of the mechanical movie apparatus, of its dialectic of movement and stillness halting the single frames of the continuous celluloid reel for a moment in order to evoke the physiological after-image and neuronal image-blending within the observer; Laura Mulvey, Death 24x second, xxx 2006, 12 (on Dsiga Vertov)

- Muybridge's and Marey's chronophotography technically the Aristotelean definition of time as numerical measurement of movement against the phenomenological philosophy of time (St. Augustin, Husserl). Movement became time-critical by mechanical analysis; *tempo-real* moment of recording - sublimely below human perception - undermined the traditional symbolic order of narrative time

- operating inside the cinematographic camera (resp. the projecting apparatus) the clock mechanism, including a form of mechanical *escapement* which became essential for the "binary information digit" as so-called "hindrance" (materially the electro-magnetic relay) in Shannon's logical circuit diagrams

- *integrates* cinematography continuous time in 24 frames/sec. and thereby mechanically performs Leibniz' infinitesimal calculus as approximation by numerical discretization.[195] The "analogue", apparently continuous signal is pre-digital in the sense of its implicit mathematicity. Analogue movement becomes digital as "movie"; current "post-digital" culture nothing but the application of such being in the physical world; due to Fast Fourier Transform the speed of technological simulation happens in real-time

Cinematographic spatialization of time

- apparent temporal indexicality of the cinematic sign "which would not be that of its own functioning. This is what imbues cinematic time with historicity" = Mary Ann Doane, The Emergence of Cinematic Time. Modernity, Contingency, the Archive, Cambridge, Mass. (Harvard Univ. Press) 2002, 23; different from "analog", time-continuous signal recording, cinematography does not record a continuous tempor(e)ality outside itself, but in fact *spatializes* it - a linear, but not steady but interrupted geometrization and thereby mathematization in terms of Bergson's critique of the moving image <see Doane 2002: 66>. With each discrete photographic frame which is in fact *stilled* during recording and projection by the intermittant mechanism of the apparatus, a sampling of the present takes place which is insteant archiving. "Once the present as contingency has been seized and stored, it ineluctably becomes the past."[196]

- translation into the chrono-symbolic order equals the cinematographic recording with the written document: In the moment of reading / viewing "it becomes the experience of presence" = Doane ibid., as long as the physiological persistence of vision and the phsychological *psi* phenomenon result in the virtual impression of continuous motion. Such a repetition of the present moment, though, fundamentally differs from electronic "live" transmission of visual signals. In terms of informational entropy, such a re-

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[195] See McLuhan, Die magischen Kanäle, Dresden / Basel 1994, 238
[196] Doane 2002: 23

viewed present is redundant: "The act of filming transforms the contingent" - which is no finite alphabet on the source side - into a discrete series (time-string) of visual characters, "reducing its contingency" <Doane ibid.> - unless the sampling theoreme in the mathematical sense of communication engineering is being applied. The act of cinematographic recording is not historicizing but quantizing. Against the prevailing notion of "the archive's historicizing impulse" <Doane 2002: 30>, the techno-archival operation asks to be decoupled from its tight alliance and absoption with the historical discourse. "The cinema engages multiple temporalities" = Doane 2002: 30 - not only the narrative diegesis, but first of all (in the media-archaeologial interpretation) the chrono-mechanism of the technical apparatus itself. The instant recording which takes place in cinematography is "archiving the present" indeed, but the historicistic interpretation of this act ("cinema transforms the present into immediate history"[197]) does not refer strictly to what the apparatus does. The "historicizing" quality only works when the technical analysis is coupled with contextual, that is: media-external narratives.[198]

The "quanta" of human perception of the present - always already cinematographical?

- Karl Ernst von Baer identifying what cybernetics later defined as "subjective time quantum" (SQ) for the phenomenological perception of the present, which according to measuring in physiological laboratories (Wilhelm Wundt) extends between 1/10 and 1/16 of a second = "Vorwort der Schriftleitung" (preface Helmar Frank) to the reprint of K. E. v. Baer, xxx, in: Grundlagentexte aus Kybernetik und Geisteswissenschaft (GrKG), xxx, Quickborn (Schnelle) 1962; Canales, Tenth of a Second; appears von Baer's lecture in 1860 like a pre-cinematographic identification of the single frame; consequently Frank 1962 asks: "Folgen unsere Erlebnisse tatsächlich in diskreten Zeitabständen wie Filmbildern aufeinander?" ibid.; technologically induced model of the time-window of the present criticized by Henry Bergson in chap. 4 of his *Évolution créatrice* as false, mathematical time concept, different from the very nature of time as *durée*. Informational aesthetics has carried this time-discrete analytics further, identifying the limit of cognitive apperception to 1 bit/SZQ per second.[199] This is "photofilm" on the operative (rather than film-dramaturgic, diegetic) level of analysis

- coincides cinematographic frequency with the hearing threshold of impulse sequences into the psychophysical impression of a deep tone (such as very low organ pipe)

Stilled time: The "moving" photographic image

- Bergson criticizing cinematic delusion as mathematical clock time which

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[197] Doane 2002: 105

[198] Only "the spectator's historical knowledge inevitable makes the event 'historical'": Doane 2002, note 79

[199] Helmar Frank, Kybernetische Grundlagen der Pädagogik - eine Einführung in die Informationspsychologie, 1962

samples duration (the true essence of time) into measurable, spatial slices; geometrization of time the message of digital culture itself with its sampling techniques and mapping of time into topological storage and data processings. Temp*aurality* here, does not endure any more."Benjamin might say that the loss of aura associated with electronic reproduction is a function of its inability to *endure*"[200]

- *delta-t* the temporal interval of photographic signal "inscription". the chemical exposure time to light has been increasingly approaching zero, transforming from almost Bergsonean duration to almost Dirac impulse for measuring the temporal moment; temporality of the photograpic plate is latency; momentary flash (or rather long exposure in early pre-kalotypic photography) embodying different temporealities

- in media-archaic incubation epoque of photography, took a long time interval for the object to get fixed by interaction of light and silver grains on the photochemical carrier. For humans and other animals, this meant suspending any movement, almost: fossil like freezing during a portrait session, becoming a statue for a certain interval of exposure. Whoever nowadays, in the age of photographic clicks, undergoes this archaic experience in face of a pin hole camera, makes this experience of time itself passing as still - with the curious side-effect that in the background things happen which do not get inscribed like in the famous Daguerrotype of the Boulevard du Temple in Paris which looks empty except one human sitting in a chair to get his shoes polished

- a temporality which transcends the inherent limits of photography; a photogramm technically can only be a snapshot of time - unless there is long-time exposure or overlaying, like in the early days of photography and in Bragaglia's photo-dynamism, and notably in Ètienne-Jules Marey's serial chrono-photographical exposures. In whatever experimental form, kinematography is still composed of intermittance-rhythmicized stills

Digital presence: the "moving still"

- from the first public film screenings onwards, a disruptive cognitive dissonance between the affective illusion of continuous movement and the parallel knowledge that this is technically achieved by radical photographical discretisation

- human sense of the actual present irritated by the cinematographic presence of the "moving still" - that is, when continuous, "analog" time is recorded in discrete "digital" frames. The static or stationary shot, while the recording camera is still moving the reel, dissolves the dichotomy between "still" and "moving", resulting rather in *imagenesis*[201]

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[200] `Doane 1990: 227`

[201] Abstract to the lecture "Still Einstellung: Stillmoving Imagenesis" given by Jon-Inge Faldalen (PhD Candidate, Department of Media and Communication, University of Oslo) in the research seminar *Medien, die wir meinen* at Humboldt-University, Berlin, Media Studies (Media Theatre), May 7th, 2014

- cricial difference between *presence* and *the present* in the chrono-technical sense of what Walter Benjamin, in his essay *Über den Begriff der Geschichte* (1940), termed *Jetzt-Zeit*: "a notion of time that is ripe with revolutionary possibility, time that has been detached form the continuum of history"[202]

- the more film comes close to registering what humans perceive as living motion, the more, as technology, it underlines the unbridgable gap between technical animation (by recording and replay) and organic bodies, resulting in an allegoric sense of melancholy which self-reflexively accompanies early film. The content of artificial, technical "animation" is the *liveness* of a "movie" only on the perceptual level; cognition knows the actual message of discontinuous, mechanically controlled stepwise motion; Laura Mulvey, Death 24x a Second. Stillness and the Moving Image, London (Reaktion Books) 2006

- late nineteenth century, the psycho-physiological discovery of the "tenth of a second" as perceptual unit of what humans experience as the present, and chronophotographic analysis of motion; coincided with the emergence of cinematography and its frequency of image projection to produce the impression of a continuous movement; in fact their measuring and transmission instruments were cooriginary. Commenting on "modern communication", Thomas Edinson's chief laboratory engineer remarked: "We all live in a tenth of a second world."[203]

- dramatic epistemological difference between the "analogue" electronic (video) image which as an effect of the cathode ray tube unfolds in time itself, as opposed to the cinematographic image where its still frames are externally moved by the apparatus

- any media archaeology of "movement" based on the close analysis of what occurs *within* material apparatus - different from external phenomenological cinema studies.[204] The intermittant drive has been the condition of possibility (*arché*) of the kinematographic effect (and micro-temporal affect, the "presence shock").

- digital images "images" no more, but alpha-numerically coded texts composed by hexadecimal symbols (the "technical image" as defined by Vilém Flusser[205]). Any digital image can be printed out as radically non-iconic "dump file" matrix.

- "Treat time as discrete": In a variation of Alan Turing's definition of digital computation, this introduces *discreteness* into movement

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[202] Oxford Reference; http://www.oxfordreference.com

[203] A. E. Kenelly, The Metric System of Weights and Measures, in: Scientific Monthly 23, no. 6 (1926), 551 [quoted here after: Jimena Canales, A Tenth of a Second. A History, Chicago / London (Univ. of Chicago Pr.) 2009, 5

[204] For a brilliant example see Willy Merté, Die Grundlagen der Kinematographie, in: Naturwissenschaften Bd. 7, Heft 25 (1919), 435–443

[205] See Vilém Flusser, Into the Universe of Technical Images (trans. Nancy Ann Roth) [*1985], Minneapolis (University of Minnesota Press) 2011

- media-archaeological research not about the "true" nature of time but rather unfolds the operative processualities of technical media in combination with neurological signal processing within humans. All of the sudden, the transcendental notion of "time" implodes into a multitude of events.

- logocentristic concept of the present (just like "the continuous") is not the real at all as physical reality, but itself is metaphysics when compared to what actually occurs microtime-delayed

- in former cinematographic and again in "digital" media times, humans experience the present always already as temporal simulacrum. "Practically, we perceive only <...> the past gnawing into the future"[206] - which exactly corresponds with the function of the ultra-short "cache" memory, the intermediary storage device in the Central Processing Unit of high-speed digital computers as kind of dynamic, transient archive.

- what is experienced by humans as a temporal horizon (such as a musical melody), matched by "predictive analytics" in algorithmic computation, allowing for mathematical intelligence to become operative. Media archaeology focuses on the identification and description of such micro-media-dramaturgies

- discontinuous mutation, which is the techno-temporal reality behind the apparent "post-digital" smoothness in computing

Photofilm has already prefigured the digital image

- photofilm, if not understood as a literary, film philological genre, seen through the lense of narrative analysis, but taken at face value as its most basic event: discrete "sampling" of reality by cinematographic time-discrete recording, the human / machine divide becomes crucial. Human perception is "smoothing" discontinuous photographic samples (frames) into the *sensation* (von Helmholtz) of continuous movement, but this takes place in neuronal cognition only, whereas analogue signal measuring and recording (since times kymographic and phonographic recording) actually *is* continuous

- media-archaeological perspective turning notion of "photofilm" upside down: can be identified as a symptom within a much broader epistemological context, which is technical media analysis (measuring, recording) and synthesis (projection) of the "contemporary" present

- after chrono-photographic "sampling" of movement by still iconic frames, now "digital" sampling of the present mo(ve)ment as technical analog-to-digital conversion by means of the sampling-and-hold electronic module, kind of "cinematography" already: a non-iconic capturing of movement. The analysis of movement has been a key function in the development of cinematography (prior to narrative "movie" cinema). "The inscription of the gesture is a central concern for chronophotography (Marey, Charcot, Gilbreth), psychotechnics

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[206] Henri Bergson, Matter and Memory, transl. N. M. Paul / W. S. Palmer, New York (Zone) 1991, 150 [as quoted in: Doane 2013: 94]

(Munsterberg) and in the new modes of perception sought by the various film movements of the 1920s (Vertov).

- media-active archaeology: cinematographic analysis gave access to the 'optical unconscious' (Benjamin, Epstein), a different kind of "archive", through the means of the close-up, slow motion, repetion and frozen movement; cinematographic camera, especially in slow motion (akin to "photofilm") gives access to differend kind of nature than is usually disclosed to the human eye; thus it opens a different kind of archive of the present (Benjamin's "optical unconscious"[207]), which turns out to be technological in the literal sense of Sigmund Freud's (and Jacques Lacan's) notion of the psychic *apparatus*

- photo-cinematographical mode of sampling the present moment relates to the analysis of movement in the digital domain. "In the biometrics of digital video surveillance, the analysis of the gesture becomes automated pattern recognition. Motion capture is a decisive breakthrough in this analysis, as it separates the motion pattern from the photographic representation"[208]; formerly iconic film image, as algorithmically "reasoned" sequence, becomes "diagrammatic iconicity" (in terms of Charles S. Peirce)

- "The difference between silver-based film and digital is the absence of the shutter. No more flicker"; literally film is made of still photographs after all. "But the digital film is not. Underneath there is a grid of pixel-size slots, and it is fixed."[209]

"Sampling" the visual present (recursive images, thumbnail movies, kinematographical projection)

- phenakistiscope discs once providing for a real animation device, presented to the public by Joseph Plateau in 1833. "The artist(s) only had 8 to 12 frames to work with and these had to form a loop. The results are quite compelling and surprisingly fluent, although many movements are incorrect [...] more than 40 years before Muybridge started his photographic motion studies" = McLeans Optical Illusions: http://www.youtube.com/watch?v=3JeN3uk2ClE; such for-running of cinematography proper does not extend to archaeological dimensions in the literal sense, such as an ancient Oriental ceramics decoration depicting a chrono-photographical sequence of movement states; http://www.youtube.com/watch?v=IpAFmuSehRg http://www.cais-soas.com/CAIS/Art/porada/porada-akkad.htm; such "animated" image sequence the starting of the "moving image" for media history? In his classic "archaelogy of the cinema" C. W. Ceram puts the prehistory of the motion pictures straight: neither the baroque automata and marionette theatres led to genuine moving picture sequences. When tracing such

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[207] Benjamin 2002: 303
[208] Trond Lundemo, lecture "The (Un-)Attainable Gesture: Two Modes of Motion Pattern Recognition", colloquium *Medien, die wir meinen* (Media Studies, HU Berlin), 15 June, 2011 abstract
[209] Babette Mangolte, Afterwards: A Matter of Time, in: Richard Allen / Malcolm Turvey (eds.), Camera Obscura, Camera Lucida, Amsterdam (AUP) 2003, 261-275 (264)

perceptual shocks of "cinematography" *avant la lettre* backwards, another flash-back leads to an archaeological scene proper. An irritation of the visual immediacy of the present can happen within one image scene itself (as known from psychological experimentation)

- retracing the "moving image" already trapped by the historical discourse with its obsession for origins; flipbook not a media-historical improvement of "animation" scenarios on ancient pottery; the relation is rather pre-historic in a structural, that is: media-archaeological sense

- media archaeological analysis developing a special sensibility for discontinuities, ruptures, thresholds, limits and series; "Introduction" to Michel Foucault, The Archaeology of Knowledge [FO 1969], London (Tavistock) / New York (Routledge) 1972 http://www.marxists.org/reference/subject/philosophy/works/fr/foucault.html; re(oc)curs such non-narrative shapes of time within the cinematographic apparatus itself: dis/continuity (with the slash signifying the kinematographic cut itself) is the very essence of the mechanical movie apparatus, of its dialectic of movement and stillness, halting the single frames of the continuous celluloid reel for a moment in order to evoke the physiological after-image and neuronal image-blending within the observer

- transitoriness of human perception of a landscape passing by (out of a train window as *dispositif*) differs from the filmic registration and projection of the same scene, as expressed in Haiko Daxl's video installation *Le Cinéma – Le Train*: "Film leads and film takes of railways are the raw footage of this work. By manipulation and montage in relation to the musical composition there are points for thoughtful excursions, roundabouts, dreams, curves, imaginations and lost memories"[210]

- as long as human perception not yet media-culturally *trained* and accellerated and finally used to rapid kinematographic image sequences (both on the single frame projection level and the filmic montage), it could not distinguish the discrete elements passing by. Indeed, Walter Benjamin insisted on the historicity of human sensation - which is, among others, a function of its technological conditions

- first generation of passengers using trains for transport not yet prepared for kinematographic perception: "The flowers are not flowers anymore, but spots of colour, or better to say red and white stripes. There is no point, everything turns into stripes. Cornfields like long yellow strands of hair and meadows like long green plaits. Church towers and trees start to dance and merge in a lunatic way with the horizon. Sometimes a shadow appears, a ghost (...) and disappears like a flash" = Victor Hugo in 1837; "ghost" became an electronic being with Vladimir Zworykin's Iconoscope (1923) where the image through the lense is projected upon a mosaic plate of glimmer, to be scanned by a cathode ray beam in order for the emitted electrons to be amplified. This an invisible image consisting of electrons which only exists in intermediary storage =

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[210] Video commentary in the exhibition catalogue *Media-Scape* (the Biennal for Time-Based Arts), Zagreb, September / October 2012, edited by Ingeborg Fülepp, 25

Wolfgang Hagen, Das dritte Bild. Kontingenzen und Zäsuren in der Technikgeschichte des Fernsehens (2003, lecture University of Basel); see http://whagen.de/main.php

- exhibition *Vom Funken zum Pixel*, 28 October 2007 til 14 January 2008, Martin-Gropius-Bau Berlin, curatierted by Richard Catelli

- photo-filmic "moving still" remaining an oxymoron

- relationship with moving and non-moving images essentially altered by mobile recording and playback technologies; permitting to immediately process and forward in real-time the material being record already in moment of observation; merging of the image-producing devices, no more hardware-based conscious / alternating decision whether to shoot photos or film = conference draft *Photofilm. Sampling the Archives*, Budapest, November 2017)

Digital sampling of "analog" moving imagery

- "digital" (time-discrete) sampling (A/D) radically alters the media-ontological quality of "analog" signal transduction

- "analog sampling" in electronic imagery (video / television): capturing the value of the smoothly varying signal by transduction into voltage at regular intervals. "The frequency at which we sample the signal has to be sufficiently high to collect enough samples to build up a picture. Too few samples and we miss information; too many and we waste memory storage" = McLean 2000: 108; bandwith as precondition for re-generating the signal in time-critical fidelity is defined by the so-called Nyquist criterium: "The frequency for sampling a signal should be a minimum of at least twice the maximum frequency within that signal" <ibid.>. Digitizing signals as analog-to-digital conversion is achieved in the core electronic "sample-and-hold" module, which is micro-kinematographic by ultra-short intermediary storage of time-discretely sampled values - the time-tricial micro-intervall. "Taking samples of the voltage at regular intervals gives us a sequence of stable voltage values that we feed to the converter hardware. Each stable voltage value is converted into a number, represented in binary notation to reflext the hardware implementation. The scale of these numbers is adjusted so that the extreme numeric range represents the extreme range of brightness values. For an 8-bit wide binrary number, those extremes are 0 to 255, equivalent in binary notation to 00000000 and 11111111 respectively" = McLean 2000: 108

- enigmatic metamorphosis from signals into information with its smallest units, the bit. By quantizing the sampled values, "the stream of numbers is created into a list of values that are stored in the computer as a data file holding the raw, unprocesse data. The signal is now digital and is the starting point for digital signal and image processing" = Mclean ibd.; extended to digitizing video images, "line by line, the correction values plot out the profile of errors in the signal's timing"[211]

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[211] McLean 2000: 93

- "memory" from the archive of earliest recorded television images depends on computer algorithms as true nonhuman archaeologists: "If it were not for computer technology, Baird's grammophone videodiscs would continue to be curiosities that merely hinted of a time before television as we know it. Their latent images would remain unseen and the information imbedded in them would still be compeltely unknown" = McLean 2000

- computer-augmented Heideggerean *aletheia*; "radical" media archaeological investigation stays close to mathematics, a necessary answer to the turn from video as electronic "image" (signal) to codecs (coded symbols)

- McLean resisting the digging metaphor from Classical Archaeology: "Unlike traditional archaeology, the artefacts are not embedded in layers of history but have existed in both private and public collections, largely ignored as curiosities"[212]; media time is latency time. Consequently, Baird's *Phonovision* is no "dead medium" (Bruce Sterling) at all, but a technological aggregation, waiting for its re-enactment as operative signal processing which is the definition of its "medium" state - which is no frozen "state" but a temporal form of existence

Digital moving image compression

- digitization of analog electronic video signals, like the CCD chip in digital photography and movies, results in a grid, filtering temporal flow into a Cartesian matrix which makes signals addressable as numerical objects for computing

- MPEG's "temporal correlation" between frames, its past, presents and futures shrinking into technical re- and protentions, and predictive algorithms; no technological manifestation of human time consciousness as expressed in Husserl's phenomenology at all; digital *imagenesis* (neologism created by Jon Inge Faldalen for his forthcoming dissertation at University of Oslo, Norway[213]) radically differentiates the still from the moving image

- I-frames setting the scene "with a single key frame. Thereafter, in the relentless pursuit of shrinking bandwidth, the P- and B-frames, within their macroblocks, change that initial key frame whenever there's movement (…) Fixed digital IP cameras are only concerned with movement within the area of coverage (…)."[214]

- aims video compression "to reduce the spatial redundancy among the picture elements and to reduce the temporal redundancy between successive frames, i. e. interframe coding"[215] and *predictive coding*

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[212] McLean 2000: xvi
[213] See Jon Inge Faldalen, Still "Einstellung": Stillmoving Imagenesis, in: Discourse. Journal for Theoretical Studies in Media and Culture, vol. 35 (2013), Iss. 2, Article 5
[214] Anthony C. Caputo, Digital Video Surveillance and Security, Oxford (Butterworth Heinemann) 2010, 36
[215] Tomas Fryza, A Complete Video Coding Chain Based on Multi-Dimensional

- MPEG-2 as standard for image sequences on DVD defines "a bitstream that tries to reconcile the complicated psychophysical, technocultural, and political-economic processes of seeing."[216] Computing absorbs time: "Motion video can be manipulated as a form of computer data" (ibid.). "Algorithmically, MPEG-2 combines several distinct compression techniques", *inter alia* "converting signals from time-domain to frequency domain using discrete cosine transforms, quantization" (ibid.)

- "A sky could be mostly blue. Rather than transmit an exact replica of the sky, why not use an algorithmic process that transforms the blue sky into a quasi-statistical summary of the spatial distribution of blueness?" = Mackenzie 2008: 50 f.; a child's pragmatic graphic abbreviation of a ketch of monotonous window series in a sky-scraper building by simple changing the repetitive window drawing by writing "etc.", in: Rudolf Arnheim, Entropy and Art, xxx

- Discrete Cosine-Transform encodes complex time-/space-variant signals into a series of discrete frequency components which can be added together to reconstitute the original signal during decoding. "Nearly all video codecs transform spatially extended images into sets of simple frequencies"[217] - kind of *implicit* sonification, a time-critical operation and its inverse frequency space: "This allows them to isolate those components of an image that are most perceptually salient to human eyes" (ibid.). Counter-intuitively, a videoframe can thereby be seen as a waveform (ibid.). This implies a notion of sonicity which is liberated from its grounding in acoustics, referring rather to the musicality of "time" events itself.

- inner-image data compression accompanied, in MPEG-2, by *motion prediction*. "Interpicture motion prediction compression relies on forward and backward correlations, <...> in particular on the calculation of motion vectors for blocks."[218] Is this a techno-mathematical escalation of one of the most archaic analytical cultural techniques in the occident, the breaking down of oral language flow into smalest, in themselves meaningless vocal-alphabetic symbols? "Rather than the raw pixel being the elementary material of the image, the block becomes the elementary component" (ibid.).

Asymmetries with Photofilm: photosound?

- an asymmetry within the so-called audio-visual media disclosed in the filmic genre of "still movies", known as photofilm[219]: long shots with quasi-photographic endurance. One can cut out a single frame in a film, copy it and produce a long (seemingly) immobile sequence (in fact, the medium - be it

Discrete Cosine Transform, in: Radioengineering Bd. 19, Heft 3 (September 2010), 421-428 (421)

[216] Adrian Mackenzie, entry "Codecs", in: Matthew Fuller (ed.), Software Studies. A Lexicon, Cambridge, Mass. / London (MIT Press) 2008, 48-55 (50)
[217] Mackenzie 2008: 51
[218] Mackenzie 2008: 53
[219] See Gusztáv Hámos / Katja Pratschke / Thomas Tode (ed.), Viva photofilm. bewegt/unbewegt, Marburg (Schüren) 2010

mechanically for the cinematograph, be it electronically for the video monitor - moves constantly), but the accompanying audio track, cut out of one frame, in fact is a sample in its technical sense (the sampling theorem) which - being reproduced, would rather result in a single signal of sinuisoid quality. An image (f. e. a portrait) can be visually preserved in the "photo film", but not a spoken word - unless the cinematographic apparatus is explicitly used for sampling sound into "grains" for resynthesis, Denis Gabor's "acoustic quanta"

Film *versus* video: Memory on demand?

- video camera and recording, in surveillance or as media-art, a combination of visible reality and its storage. If only used to transport electronically generated pictures, the video tape can not be the original

- some videos obviously an attempt to make a film; regard video simply as a medium for recording, producing and projecting or its specific unmistakable medial aesthetic. Especially in comparison with film, videocity is profiled

- fundamental aspect of film, i.e. montage (a segmentation in time), was interpreted by the fundamental aspect of the early TV, the live-recording (a segmentation in space) in a key element of the studio equipment: the video change-over switch. A simple switch represented Eisenstein's most important montage, i.e. the cut, and with a simple switch on each camera, cuts to every conceivable point of view could be made. Griffith's "fade-to-black" became a gradual diminution of the signal tension with a variable voltmeter. (...) That is how, without the possibility to record, a simulation of cinematically treated time could be produced by an electronic live-instrument" = Viola, Bill (1993) Der Klang der Ein-Zeilen-Abtastung. In: Theaterschrift 4: The Inner Side of Silence. Brüssel, 16-54 (24)

- his *Exposition of Music – Electronic Television* in the gallery Parnaß, Wuppertal, from March 11th – 20th in 1963, Nam June Paik saw the interference of the picture caused by magnetic modulation of the shaft-images as aesthetic >participative< tv; figures of the tv-picture are exposed as a function of engineering/ technological raster. Paik himself still speaking of TV is suggestive of the difficulty of distinguishing between video and television. The difficulty to differentiate is that electronic video-technique? Is the basis for both. Consequently using the terms of TV and video we do not really mean the electronic aspects those in content but the structure of imparting/ conveyance = Herzogenrath, Wulf (1983) Videokunst. Ein neues Medium - aber kein neuer Stil. In: ders. (Hg.) Videokunst in Deutschland 1963-1982. Stuttgart, 0-27 (13); interference is not experienced as bad luck but as aesthetic stroke of luck; Bill Viola´s video tape *Information* 1973 (illustration #2, In: Herzogenrath 1997, 293)

- video-art still distinguished from other media art as long as the specificity of its technology maintained instead of becoming nothing more than another digital format. Nam June Paik pursued proper media-archaeology - a surgical operation in the medium itself. "In the late Sixties this imitation of film was overwhelmed when artists began to poke underneath the surface in order to reveal primary characteristics of the medium and to release the unique visual

opportunities of the electronic image" = Viola 1993, 24 f.

- initial fascination at techno-qualities of video – the "scandalon of the medium" (Irmela Schneider) – increasingly let (mostly narrative) contents go first. The law that media-archaeology ends where `content´ - as a distraction from the medium as defined by Boris Groys´ (the submedial) – begins

- acoustic character of video as a reverberative image. "From the point of technology, video has evolved from sound(electro-magnetical), its association to film leads into a wrong direction, because film and its grandfather, the photography, are members of completely different branches of the family tree(the mechanical/chemical one). Electronically transforming a kind of physical energy into electric impulses, the videocamera is originally related to the microphone, not to the movie camera."[220]

- with application of magnetic recording in television production since 1958/59, "the viewer is not in the position" any more "to judge whether the programme he watches is a live or a recorded one."[221] The reversed case occurs, when video cameras are placed onboard a missile, there is a coincidence of event, transmission and reception; difference of the act (res gestae) and its narration (historia rerum gestarum) implodes. Different quality of informational image: satellites do not send video signals but data, that become images during the process of *imaging*; the limits of videocity with pixels; 'video' in digital space will be just an anachronistic name. What, in case of the BK 3000 Colour by Grundig, called 'VCR', will disappear is the cassette. If the chip replaces the carrier media, the recording, the processing and the saving - the three components of a technical definition of media - converge in one material form of existence, the closed integrated circuit.

Implicit sonicity: No "still" with(in) the electronic image

- moment that a cinematographic image sequence comes closest to the photographic still - in the genre of "photofilm" -, it most radically differs from it: "Das Stilleben ist die Zeit, denn alles, was sich verändert, ist in der Zeit, nur sie selbst verändert sich nicht [...]. In dem Augenblick, in dem das kinematographische Bild dem Photo am nächsten kommt, unterscheidet es sich zugleich am radikalsten von ihm" = Gilles Deleuze, Das Zeit-Bild. Kino 2, Frankfurt/M. (Suhrkamp) 1997, 31; the real medium message which articulates itself between the lines of Deleuze's analysis of the film image, is the video image already. The tempoREAL of electronic *imaging* is transitory itself, a true time image, since it is never in the present, only before and after in the "flying spot" of the cathode tube ray for transduction of celluloid film frames into video signals.[222] This actually recalls Zenon's philosophical paradox that one can never caputre an arrow while on the fly, since at every moment it would appear standing still - which triggered Bergson's critique of the chronophotographic

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[220] Viola 1993: 20
[221] Knut Hickethier, Fernsehen, Modernisierung und kultureller Wandel, in: Flach, Sabine / Grisko, Michael (eds.), Fernsehperspektiven. Aspekte zeitgenössischer Medienkultur, Munich 2000, 18-36 (32)
[222] See Webers 1991: 557 ff.

effort to catch the essence of movement (as expressed in chap. 4 of Bergson's *L'Évolution créatrice*)

- the photographic *punctum* (as desribed by Roland Barthes) corresponds with the temporal *momentum*; the decisive difference is between the photographic print (or negative) and the videoframe *still*. Is there (a) stilled time in electronics? Videodisc can contain tens of thousands of stills; but an electronic "still" (different from a print taken out of a chemical film) never still, always flickers, as a function of the pure time of the cathode tube ray, thus: permenently being re-generated

- in every digital video beamer projection, even the "still" image a function of data arrays which are permanently being refreshed ("the enduring ephemeral", according to Wendy Chun)

- time which passes can be either analytically measured (discrete clocking / chronophotography / cinema) or experienced as endurance in human "inner time consciousness" (Edmund Husserl 1927). Once a "born digital" or digitized film image is projected on screen by a beamer, what still seems like a photographic image reveals its processual character; it has to be re-generated out of computer storage permanently / dynamically; there is no "still image" in analoge video space and digital representation

The impossible "still" image in video / television

- an electronic image never in identity with itself since line by line it is constantly being (re-)written and refreshed (in computing imagery)

- electronic image (in video and television) a chrono-ontological hybrid; "still" consists of quasi-photographic frames, but split into half images which are interlaced in TV, therefore an optical illusion, and they are essentially time-image instead of simply stepwise moving still images (not in the dramatic sense of Deleuze but electro-technically) - in fact closer to the Bergsonean *durée* than ever expected (an argument in Maurizio Lazzarato's *Videophilosophie*)

- the conceptual, but not electronically existent "frame" in (analog) television and video consists of strictily sequential signals (lines), interlaced into what slow human retinal and cognitive perception fuses into the impression of a coherent moving "image"

- technology itself becoming the true image archaeologist; earliest known recording from a Television Transmission the revue *Looking In*, performed by the Paramount Astoria Girls on the BBC Baird television system (30 lines) in April 1933; has been preserved by an enthusiastic amateur on his recording equipment on aluminium disc, in fact the Baird *Phonovision* system.[223] Media-archaeologically processed and restored by digital filter algorithms, the key to iconic clarity is movement itself - which can not be arrested in a photofilm-like

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[223] See http://www.tvdawn.com/recordng.htm = The Restored Video Recordings 1927-1935

still image. Any photographic reproduction of one of the 30-line television broadcast as stills in a printing medium 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 [...] builds up a model of what we are looking at"[224]

- Baird's very *terminus technicus* "Phonovision" hinting to the signal-ontological gap between the photofilm "still" and "sonic" silence (pause); signal transmission in early electro-mechanical 30-line television is closer to gramophone and medium wave radio than to the photographic "image", just as video art protagonist Bill Viola once defined the electronic image explicitly as "The Sound <sic> of One Line Scanning"[225]

- Bill Viola's "drone" aesthetics of the electronic image and his notion of the "sound of one line scanning" not just an allusion to the music aesthetics of India but a precise "phonographical" interpretation of the time-linear scan process. The implicitely sonic essence of the video "image" gets further support from the fact that composers and musicians (like Paik and the Vasulkas) were among the first to understand the performative principles of this technology in its fundamental difference from film; even a "silent" video image is still implicitly sonic

- oxymoron in TV production "live on tape"; magnetic recording (time signal) vs. on celluloid (time-discrete)

"Restoring" Baird's early television recordings: Media Archaeology as method of critical research "close to the signal" and Media Archaeography as mode of its description

- Donald McLean's achievements in "restoring" Baird's early television recordings most appropriately situated within the media archaeological field. Media archaeology as research method deals with technological artefacts, in the present, or as "past-continuous-present" (to borrow the title of Dan Graham's notorious video art installation based on magnetic tape-delayed signal feedback). Media archaeology consciously isolates technological evidence (at least for a moment) from social, discursive, cultural, historical contexts, to let it speak in its own language, as monument in itself rather than document for external circumstances (Michel Foucault, *Archaeology of Knowledge*, "Introduction").

- Media archaeology as a method understood in another sense as well: making

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[224] Donald F. McLean, Restoring Baird's Image, London (The Institution of Electrical Engineers) 2000, 211 f.
[225] In: same author, Reasons for Knocking at an Empty House. Writings 1973-1994, London (Thames & Hudson) 1995, 153-168

technologies themselves become archaeologists of signal evidence, such as measuring devices analog (oscilloscope) or digital (filter algorithms); to quote the signal epiphany in McLean's research: "The green flicker of the oscilloscope trace was difficult to decipher. I was looking at what was supposed to be a video signal. I could see that the waveform repeated in a slowly changing pattern every 80 milliseconds, and another pattern repeated within it. This was undoubtedly a signal from out of history: a 30-line television signal with a picture rate of 12 1/2 per second" = McLean 2000: xvii

- McLean's research practice close to media archaeology as possible in the sense that he made technological media themselves the real "archaeologists" of past media signal events

- media-epistemologically relevant, McLean's successful restoration of early 30-line television recording bringing out what looks almost oxymoronic at first sight: only with digital analytics (Digital Signal Processing) the hidden or obsucred analog signals could be re-presenced. Current computing therefore time-tunnels the "historic" gap which has separated the present from such past recordings so far: "If it were not for computer technology, Baird's *grammophone videodiscs* would continue to be curiosities that merely hinted of a time before television as we know it. Their latent images would remain unseen and the information imbedded in them would still be compeltely unknown" [McLean 2000]. The media archaeological key operation is no metaphoric "digging" but a techno-mathematical procedure: analog-to-digital conversion, sampling. *Sample-and-hold* means first of all the time-discrete sampling of the time-cintinuous analog signale, which allows for its quantisation, that is: symbolical numbers, a translation (or even "transsubstantiation" in terms of Christian liturgy) into the digital, that is: the mathematically calculable, transforming time into frequencies. A media philological act "to transcribe them" - sc. the distorted, barely readable signals - "in a controlled fashion" [McLean ibid.]. "Taking samples of the voltage at regular intervals gives us a sequence of stable voltage values that we feed to the converter hardware. Each stable voltage value is converted into a number, represented in binary notation" [McLean 2000: 108].

- a focus of media archaeological research so-called time-critical media. Decisive is the so-called Shannon-Nyquist theoreme: "The frequency for sampling a signal should be a minimum of at least twice the maximum frequency within that signal" [McLean ibid.], enabling a high-fidelity reconstruction ot the signal event. The signal-to-noise ratio is not only the core question of communication engineering (Shannon), but as well for academic discourse analysis: "Message or bruit?" is the title of one of Michel Foucault's notorious lectures (author of *Archaeology of Knowledge*, French original Paris 1969).

- media archaeology of the 30-line television making McLean's project a case of "Digital Humanities" research in a more precise sense than commonly (mis-)understood (reduced to "open access to "big data"). - "digital humanties", in the media-archaeological sense, means "algorithmic hermeneutics": applying computational software as active archaeologist of cultural knowledge hidden within techno-phyiscal signals. But this is not only relevant for harvesting "bid data", but for close analysis of material technology.

- In a parallel way applied to media archaeology of the sonic, Patrick Feaster succeeding in re-playing Léon-Scott's "phonautographic" diagram of the children song *Au Claire de Lune* from pre-Edison times of 1859. Again, such media-active archaeology of acoustic recording has been possible only through highly sophisticated algorithmic filters performing signal intelligence; see as well for the earliest remaining sound recording from Norway, the Sound Archive Project at the School of Engineering Sciences in the University of Southhampton attempted a digital restauration.

- Video artist Bill Viola defining the electronic image as "Sound of one-line scanning"; sonification of the recorded television image (signal) has been an analytic tool for John Logie Baird already: "In testing out the amplifiers I used to use headphones and listened to the noise of the visio signal made. I became very expert in this and could even tell roughly what was being televised by the sound it made. I knew, for example, whether is was the dummy's head or a human face. I could tell when the person moved, I could dinstinguish a hand from a pair of scissors of a matchbox, and even when two or three peole had different appearances I could even tell one from the other by the sound of their faces. I got a gramophone record made of these sounds and found that by laying this with an electrial pic-up, and feeding the signal back to a television receiver I could reproduce the original scene. <...> If the cinema had never been invented the 'Phonovisor', as I christened the device, might have been / worth developing; it was certtainly an intriguing process. Vision into sound and sound back into vision."[226] "The mental leap here is thinking of the flat two-dimensional picture, in space, converted to a one-dimensional electrical signal, varying in time."[227]

- Media archaeology revealing the material and logical, therefore: techno-logical principles (ancient Greek *archai*) that drive signal transduction and data processing in the architectural hardware and archival textural software of computing. This necessarily includes analysis of its operativity, that is: truly processual media-archaeology, revealing temporal and time-critical patterns of the medium - just like contemporary archaeology as such nowadays shifts the focus of analysis from the distant past to the "production of presence" (Gumbrecht, Shanks): The past *is* present *in* its traces and is *made* present *through* reenacting its traces indeed.

- Media from the past "re-presenced" (Sobchack) not only by shere materiality; they rather require operative re-enactment, operative presence (which is the ratio for assembling techno-epistemological "toys" in the Media Archaeological Fundus and the Signal Laboratory at Media Studies, Humboldt University, Berlin)

- Media archaeography as writing mode for analysis of technological heritage *close to the signal* implies that instead of writing "about" past technologies (that is, intransitively) in a language which itself is foreign to the circuitry (textual description / narrative), it rather aims at *writing the media diagram*

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[226] Television and Me. The Memoirs of John Logie Baird, ed. Malcolm Baird, Edinburgh (mercatpress) 2004, 64 f.
[227] McLean 2000: 96

(transitively), akin to the circuit diagram (analog) or the source code (digital).

- consequences for communication with technologies from the past. Instead of "historicizing" in its epochal context (which is necessary but concerns rather cultural historical interests), media archaeology aims at "re-presencing" inherited technologies; see Vivian Sobchack, Afterword. Media Archaeology and Re-presencing the Past, in: Erkki Huhtamo / Jussi Parikka (eds.), Media Archaeology. Approaches, Applications, and Implications, Berkeley / Los Angeles / London (University of California Press) 2011, 323-333. This approach is based on the media-theoretical assumption that a technological artefact (be it recordings or the actual player) is in a "media" state only when signal processing (or rather: signal transducing, in the "analog" electronics case). Therefore, different from most other artefacts in the museum ("archive") of cultural history, such archaic technologies need to be "re-enacted" (historian Collingwood's term for negotiating evidence from the past, though textual in his case).

- McLean's book occasionally referred to as 'industrial archaeology', 'technological archaeology', and the author as a 'television archaeologist'. In terms of Media Science, McLean's methods of artefactual research is "more like a forensic-level investigation" (McLean); this relates to the "twin" method of media archaeology which is media philology indeed: paradoxically, only from critical, "forensic" signal analysis results true media-philological insight (not traditional philological criticism related to the con/textual metadata); see Kirschenbaum's "forensic" analysis of the computer hard disc: Matthew Kirschenbaum, Mechanisms. New Media and the Forensic Imagination, Cambridge, MA (The MIT Press) 2008

- against the media-phenomenological approach which is primarily oriented at what humans actually / affectively perceive, media archaeology aiming at striking sparks of knowledge from within technology itself - even if unremarked by human consumer senses, but relevant for scientific research which is most interested in events which sur- oder underpass direct human perception.

- Donald McLean's achievements in "bringing these images to light and unearthing the back-story from the video faults" (communication September 2017) - even "vaults"; at first glance may look like an archaeological metaphor, but calling the signal restorations 'archaeology' is not misleading at all but both a method and an aesthetics of practicing media criticism. Against archaeology as metaphor borrowed from the classical academic archaeological discipline related to the act of unearthing material artefacts underneath the ground, media archaeology is understood rather in Michel Foucault's sense who in his *Archaeology of Knowledge* defines archaeology as foregrounding the conditions of possibility for perception to happen at all (the *a priori* in philosopher Immanuel Kant's sense); this corresponds to the non-phenomenological inquiry into archaic 30-line television; signal and electronics investigation surrounding the Phonovision restoration revealed the details and frictions in the methods and mechanisms by which the material was originally recorded. "So there was far more than just the visual imagery as output from this research" (communication McLean, September 5, 2017)

- Inbetween archaeology as misleading metaphor (regarding technological

forensics) and active media archaeology indeed: magnetic prospection methods in archaeological field research as part of *imaging science*

- chronopoetically, media time as time of archaeological latency (more precisely: delayed transfer, *Delta-t*)

- as a "monument", Baird *Phonovision* recordings have become part of the archive (by inventorisation and curatorial preservation) 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 technical hardware itself to be co-archived processually (such as by "emulation" for computational objects).

For a media-archaeological interface aesthetics of difference

- visual computer interface *not* hiding its computational essence; whatever appears on monitor, actually *is* a directe enunciation / function of algorithms and codes, just different mapping (electronic transduction / symbolic transcoding)

- whenever an alphanumeric symbol on the keyboard as part of a string (a word, a sentence, a text, a formula, a graphic notation) is pressed, the single character transformed into an electro-physically coded signal. A transformation (or even "transsubstantiation") takes place, loosing "meaning", gaining "indexicality"

- most approaches to "new media" emphasizing the phenomenal side of the screen, orientation towards human audio-visual senses; "the screen divides new media studies into visual culture studies and media archaeology. Visual culture studies stem from the Anglo-speaking academy and generally treats the interface, or representations of the interface, as the media (or filmic/televisual/print representations of this interface). The second approach, media archaeology, although inspired by Marshall McLuhan and Michel Foucault, is mainly Germanic. Taking as its ground zero McLuhan´s mantras of "the medium is the message" and "the content of a medium is always another medium", it concentrates on the machine and often ignores the screen´s content. Archaeological studies critique visual culture studies´ conflation of interface with medium, representation with actuality; visual culture studies critique the archaeologists´ technological determinism and blindness to content and the media industry" = Wendy Chun, *Communication in the age of fiber optics*

- "In HI-VISUAL, objects which the system deals with such as data and program are represented in terms of icons. Programming is carried out simply by arranging icons on the two-dimensional display screen and specifying flow of data"[228]; the icon bears resemblance with the coding as a kind of visual short-

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[228] Tadao Ichikawa / Masahito Hirakawa, Visual Programming - Toward

cut of algorithmic lines

- Williams tube, not only visualizing but actually physically performing the storage / time-delay functions

- "interface" knowledge transforming from intransitive (see Latin *transitivus* = "transitive, passing over") to transitive communication - communication with no interface any more, like the former signal recording and transduction for re-play

Visual knowledge (CyberAntarctic)

- observer moving in data clouds: "We do not have an interface anymore, a mechanical interface, in the real world, we have interfaces in the network, the dynamic network"[229]

- telematic communication generating depersonalized forms of interfacing; the interface looks back (Iris scan, eye-tracking). In media culture, term „interface" suggest an inbetween of machine and human as communication partners; "Turing test" still required an interface between man and machine, a teletaper (as proposed by Alan M. Turing, Computing Machinery and Intelligence, xxx), since direct coupling between man and machine is (still) not yet possible

- what if the computer monitor does not simply translate information from computer hard- and software to human visibility, but is the message of its internatal data processing? Early C64 computer game images have been direct *outsourcing* of the RAM

Interfacing time

- by quantification, time becoming divisible into computational bits

- tracing back digital television signal processing to the inside of an electronic time-critical device for otherwise analogue image recording where the line- or framewise synchronization of electronic images is implicitely sonic (in the sense of Viola 1990): "Transforming the signal into numbers, recording them into memory, recalling them at the right moment, and transferring everything errorless back to the analogue signal first appeared in 1974 in the Ampex AVR-2 recording facility": digital Time Base Corrector, as described in the special exhibition on 60 years of television in National Technical Museum, Prague (fall / winter 2013)

- Dan Graham´s video-installation *Present - Continuous - Past(s)* (1974), interfaces media time and human presence by delay

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Realization User-Friendly Programming Environments [*Proceedings 2nd Fall Joint Computer Conference, 1987, 129-137], in: Glinert (ed.) 1990, 59-67 (59)

[229] Christian Huebler, in: Paolo Atzori, Discovering CyberAntarctic: A Conversation with Knowbotics Research <13-3-96>, online http://www.ctheory.net/text_file.asp?pick=80

- temporal interfacing: Bill Viola´s video-installation *Heaven and Earth* (1992), two monitors mirror each other, one (with a baby´s face) mirroring the other (a old, dying woman´s face) = Belting 1995: 97, Fig.: 96

- compiler of higher programming language software itself, functioning as *internal interface* already, allowing for a communication between symbolic source code and machine language

- computer monitor "transforms internal electromagnetic states *via* data buses, oscilloscope, fluorescent material etc., to electro-magnetic states in the visual range of wavelengths. A purist may write down a [partial] differential equation of the whole thing on a microscopic level where the notion of an interface seems to become rather arbitrary" = Diebner, "Preface", in: Hans Diebner, Timothy Druckrey and Peter Weibel (ed.), Sciences of the Interface. Proceedings of the International Symposium

- in imperative computing languages, "[a]lgorithms are metaphorically dumb and blind because they cannot adapt interactively while they compute" = Peter Wegner (Brown University), Why interaction is more powerful than algorithms, in: Communications of the ACM, vol. 40, no. 5 (May 1997), 80-91 (82) - *versus* "life coding", allowing for dynamic operative human-machine interface

- HTML as interface between legible text and markup tags; formalistic *versus* the temporal interface

- interface a "'zone of indecision' between the inside and outside" (Gérard Genette); doorways binary relays

- interfaces with their own *internal* reality as processual algorithms

- re-arrange order: not "HMC" but Machine-Human-Communication (van Treeck)

- skeuomorphisms derivative object that retains ornamental design cues from structures that were essential functions of the original; complete surface emulation as "semulation" (van Treeck); surface / subface as "Unterfläche" (Frieder Nake); task of media archaeology: to un-mask, de-interfacing

Photographic in/formation

- complementary approaches to the conservation of analogue memory carriers: preserving the physical, especially chemical and electro-magnetic properties of the concrete media body - since all media technologies are hardware in the first place; opposing approach is to preserve media-based memory as information, up to the extreme point of view that the material body might be abolished after its essential transformation into its pure binary information units

- to which degree archival authority of a record still depends on its material physical embodiment; importance by which carrier one generation passes on its information to the next: "We no longer collect the carriers, clay tablets,

books or floppies, just the information"[230]

- two photographs of chapel of St. George near Dobralak in the Rhodope mountains of Bulgaria (near Plovdiv); one from Mai 2004 showing the unrestored chapel, the other (August 2010) its renewed state; the medium of photography indifferent against the tempor(e)ality of its referent; its historicity lies in the entropy of its own physical state. Against this, digital photography is a-temporal, carrying the temporal trace not in its information (which is its binary essence), but in the hard- und software into which this information is embedded - thus linking to the scriptural, alphabet-based, that is: coded systems of symbolic records

- Foucauldean sense of *archive* in digital, that is: computational photography: "[I]n our time, history is that which transforms documents into monuments. In that area where, in the past, history deciphered the traces left by men, it now deploys a mass of elements that have to be grouped, made relevant, placed in relation to one another to form totalities. 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 description of the monument = Michel Foucault, Archaeology of Knowledge, transl. A. M. Sheridan Smith [*1972], London / New York (Routledge Classics) 2002, "Introduction", 3-19 (7f)

- "Evidently a different nature opens itself to the camera than opens to the naked eye."[231] Significantly in the English translation Benjamin's term "technische Reproduzierbarkeit" turns into "mechanical reproduction", thus unwillingly reminding of the difference which opens with digital reproduction: a mathematization of the photographic process, a different archive. Media archaeology is about the mathematical / symbolic logic as well, not just about engineering in the traditional sense any more. The mechanical (and then techno-mathematical) gaze opens an archive by making visible to humans what otherwise escapes the human optical sense: photo-micrography and the dynamical time axis manipulation by photography (chronophotography, slowing down and fast forwarding of motion).[232] The archive of different temporalities opens, "declassifying" time-deferred worlds: an world of what has been hidden (*secretum*) while existing nonetheless - photo-*aletheia*. Technical *poiesis* in the sense of ancient Greek *techné* as re-definied by Martin Heidegger. Both artistic and technical creations are modes of bringing forth, interrelated within the machine.[233]

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[230] Tjebbe van Tijen, We no longer collect the Carrier but the Information, interviewed by Geert Lovink, in: MediaMatic 8#1 (translation: Jim Boekbinder)

[231] Walter Benjamin, The Work of Art in the Age of Mechanical Reproduction [1936], in: Hanna Arendt (ed. and introduction), Illuminations, London (Fontana Press) 1973, 238

[232] See Emely Godbey, The cinema of (un)attractions: microscopic objects on screen, in: John Fullerton / Jan Olsson (eds.), Allegories of Communication. Intermedial concern from cinema to the digital, Rom (John Libbey) 2004, 277-298

[233] Martin Heidegger, Poetry, Language, Thought, trans. Albert Hofstadter, New

- in *The Gutenberg Galaxy*, McLuhan linking the triumph of Renaissance perspective to the rise of print culture, which correlates the mathematization of the image (previous to digitalization) with symbolical / combinatorial machines (the *abecedarium* of the printing press)

- once signals mechanically engraved (phonograph) or magnetically embedded (magnetophon, videotape) on material carrier have been transformed into digital, immaterial information, can be (virtually lossless) "migrated" from one storage computing system to another

- archival endurance not monumental fixation any more (*stasis*), but by dynamic refreshing

The archival from within photography (the digital regime)

- with mathematization of matter into informational bits, its entropic temporeality transforming: "Time no longer has physical meaning."[234] Skadden's installation *Steenbeck Loop* reminds of a time figure which literally adheres to the materiality of celluloid film: "I made 16mm films and became anamored with its ability to express time with a physical presence. Film is measured in feet; it gives time a measure of distance" = ibid.; Steenbeck film editing desk allows for cuttering but is time-consuming, requiring rewinding of the spool. In digital editing (AVID), cutting becomes non-linear, allowing for instant addressing of the image data memory

- analogue photography by its very materiality inscribing traces of time, whereas in digital photography, the temporal index becomes a stamp, a date without physical evidence of aging

- notion of "digital photography" metaphorical, since its digitality can (in HD resolution) hardly be perceived by human eyes; a former single physical medium like the photographic image as print does not exist behind the surface of computer interfaces but as a data format, an array of bytes which are adressed and processed algorithmically

- digital photograph preserving the iconic quality while loosing the indexical trace; indexicality itself of a different kind. While the analogue photographic print keeps a physical trace of the past / passed light signal, recording the light intensities, the digital pixel keeps a schematic, mathematically abtracted relation to their generating (and then sampled) analogue signals - *diagrammatic indexicality*; digital image: raw pixel data as nondiscursive units; behind: binaries. "[W]hile the pixel can be conceptualized as the technical basis for the meaning contained in the image, from a still lower level, the pixel *is* the meaning contained within the lower level system" = Rory Solomon, Last In,

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York (Harper and Row) 1975, 64. See Malin Wahlberg, A Relative Timetable. Picturing time in the era of new media, in: John Fullerton / Jan Olsson (eds.) 2004: 93-103 (101 f.)

[234] Elizabeth Skadden, Collapsing New Buildings, Master Thesis, Rhode Island School of Design, <year?>, 66

First Out. Network Archaeology of/as the Stack, http://amodern.net/article/last-in-first-out

- Foucault's "archive" a diagram (Deleuze); computational networks embody an operative machine, still topological (graphs, nodes) but with the additional dimension of temporal processes

- with electronic television, the human eye synthesizing the "flying spot" into an image. "A machine can capture the same image, without any consciousness or experience of the form"[235]; televisual image "has to be established and sustained onscreen moment by moment. With transmission, images and sets of images pass the time and fill out the current: in this sense television is always "live". <...> scanning cannot deliver an image all at once - its composition is always in process, and a "stable" frame can be instantaneously switched midway through"; different from digital image: "Although pixels can retain luminosity long enough to await the next scanning cycle and thereby approximate the succession of discrete filmic images, the fact that no image is ever constituted entirely in a single instant grants television a range of technical options for framing and editing, including incision and torque of the image´s surface" = Richard Dienst, Still Life in Real Time. Theory after Television, Durham / London (Duke UP) 1994, 20 f.

- Photographic signal recording discrete (silver grain crystals) but stochatically distributed; no coded "elements", therefore no "inscription" in the alphabetic sense of writing; an analogue measuring of time, opposed to the familiar symbolic registration of past events in alphabetic writing. The non-linearity of photo-archival memory separated this aggregation from the smooth continuity effects of historiographical narrative

- digital media a techno-logical marriage between the symbolical order and the signal-based "real", miraculously converge; computer, by digital signal processing (DSP), is capable of emulating all "analog" happenings in the real physical world (which before only the "analog media" like gramophone and video could perform) by means of algorithmically processing the strictest of all symbolic, in fact: alphabetic regimes, which is the binary code; ultimate algorithmic temporalization of photographic memory

- "found footage" having been input for renewed film compositions within the same technology and celluloid materiality; with computing digitized film, the old medium format itself becomes "footage" for the Universal Turing Machine; con-temporary of three layers: 16 or 35 mm film, produced for television programs, broadcasted after signal transduction (scanning) as electronic "image", which is finally sampled onto computer screen

Satellite "imaging"

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235 Harun Farocki, Reality Would Have to Begin, transl. Marek Wieczorek / Thomas Keenan / Thomas Y. Levin, in: Documents 1/2 (Fall / Winter 1992), 136-146 (142), here referring to: Vilém Flusser, Für eine Philosophie der Fotographie, Göttingen (European Photography) 1984

- project Experiments in Satellite Media Arts (ESMA), June 18 - July 1 at migrating art & science lab MAKROLAB, curated by Marko Peljhan and stationed in rural Scotland from May through July 2002, "[...] downloading and manipulating satellite images, raw satellite television feeds, and electronic/digital sounds in an effort to generate a series of "orbital animations" that represent and comment upon contemporary global conditions" = http://www.artscatalyst.org/htm/makrolab.htm

- satellite "image" not existing in the iconic sense any more, rather dissolves into various practices of sensing, sampling, computing, cache storing, transmitting to ground stations; only there the data stream is processed into image format (directed to human perception), altered, combined, colorized, "and stored / archived or put into circulation" (communication Lisa Parks, December 2000)

- media-archaeological vision of the "scanner" aesthetics of technically reading images (with the satellite camera being the archaeologist, like for Cleopatra´s underwater traces)

- technical *archive* (in Foucault's sense of that which defines what can be seen at all) is neither masculine in the traditional way nor feminine in a post-structural way, but unfolds an area of techno-machinic neutrality like mathematics before

- Galilei´s use of the telescope: see what no human eye could have seen before, and at the same time; the autority of such telescropic images questioned the human ways of authentification. Looking into the sky, the telescope made him see things otherwise unimaginable; at the same time, Galilei already envisioned the reverse point to view, how the earth might look from the moon´s perspective (his book *Siderus nuncius* from 1610)

- satellites "extend" - or rather genuinely new form of *imaging* - epistemologies of the visible and the real because they have been used to produce/expose "excavate" (media-archaeologically) matter that was never imagined before as part of a field of vision including phenomena in deep space, layers of the earth's surface, weather patterns. Satellite sights radically disembodied vision like radio / television previously; closer to abstract expressionist paintings of Mark Rothko than to photographic realism; technical process of signal transduction (analog) and signal sampling (digital) that occurs with the flow/transfer and encoding/decoding of electronic im/pulsees; rather translating than simply transferring signals from one site to another = notes on Lisa Parks, lecture *Mixed Signals: Media Infrastructures and Cultural Geographies* (Vortrag Einstein-Forum, 20th June, 2xxx; Lisa Parks, Cultures in Orbit: Satellites and the Televisual (Duke University Press 2003)

- Horst Völz' development of a digital data tape recorder for intermediary image storage (delayed / suspended transmission) in outer space (the Phobos mission)

Between reading and scanning the image

- once digitized into discrete elements of a grey shade / colour alphabet, images visually calculated and internally navigated; instead of forcing semantic / cultural (iconological) criteria of human image understanding upon the computer, entirely different criteria of image similarity in computing induce unexpected insights *from within* visual culture, adopting to its inherent techno-logics

- analog approach: no longer subject images to a foreign symbolic order (textual / alphabetic metadating), but approach within their signal values (video synthesizer, oscilloscope analytically); digital approach: address images in their second-order alphabet (re-entry of "textual" ratio)

- some perceptual processes operating upon data on the screen in a direct, „bottom-up" manner "by examining the data in very brief periods of time (utilizing little or no associated memory) and organizing it automatically into such features as edge, color, depth, motion, aural pitch"; bottom-up perception serial and „data-driven", and produces only short-range effects" = ibid., 37

- electronic tunnel microsope not actually transferring images of the atomic surface of matter, but analyses its object by matching data statistically and reprsenting these calculations as images - just like bats don´t perceive space iconically, but by echo orientation in space[236]

- pixel as smallest conceivable *digital* picture element, which makes sense in an iconic way only when appearing within a group; "I want control over every pixel" (Andreas Menn); option for search enginges: visual search with precise targeting, down to each pixel in an image

- Angela Bulloch's Pixel Works dissolving a cinematographic frame, after digital sampling, into technically engineered macro-pixels. With the neon-light emitted by an enlarged single material pixel block of 50 x 50 cm, the distance between the viewer and a group of pixels must be large in order to discern fractals of a cinematographic "image" / frame. Bulloch refers to a sequence from Michelangelo Antonioni´s film *Blow Up* (1966) where the protagonist, a photographer, hiding behind a tree, unintentionally seems to have recorded a murder when later developing the negative. But in trying to identify the spot, the closer the camera looks, the less is the apparent murder an evidence. The artist extends this process of identification by yet another magnification, enlarging the digital scan of this scene in great blocks of its single pixels and thus exploding the image within a sequential modular system of her purpose-build so-called *pixel boxes*, where one pixel is represented in a 50 x 50 cm monitor which are attached to complex RGB lighting systems which can be generated and programmed with any digital information; installation BLOW_UP T.V. of Angela Bulloch in the gallery Schipper & Krome, Berlin, September to November 2000; desillusioning the image betrayal of the human eye, reavealing the discrete scanner-gaze of the computer which is media-archivological, looking at the discrete units of the archival regime, not looking just for letters any more. The pixel modules also point at the fact that digital images are hyper-indexically composed by pure information, as opposed to the

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[236] See E. Gal, Geschichten vom Finden, in: Schattenlinien No. 4/5, vol. 2, issue 2 & 3 (1991), 3-35 (6)

referential image like the classical photography which still suggest a pre-discursive real

The oxymoron of the analog "picture element"

- investigating the techno-epistemology of the "picture element" in analog television engineering; technical dilettantism of amateur media archaeologists: get as close as possible to understand the relevant technical details; task of explicit media theory then (different from actual design of such technology) to identify aspects which are of knowledge relevance to non-engineers as well in a broader discourse, such as the over-simplified common "analog / digital" divide. What is relevant to know about that difference to non-engineers and non-computer science, and why is it relevant (the very "old European" philosophical desire to know the nature / essence things even if there is no immediate functional application, like Hertz' experimentation with the electro-magnetic wave, unconsciously triggering "radio"). Here the "pixel" is a fascinating subject which can very well illustrate the difference between the analog signal and its digital (i. e. informational) abstraction - even if every "bit", since it has to be implemented in real matter to operate, becomes "analog" again. First *imaging* evidence of a fetus in pre-natal medical diagnosis is not metaphorical but actually a "pixel" since from analog time-delay in sonographic non-invasive measuring, by computational algorithms, an "image" is calculated from the propagation and echo of sonic waves

- concept of "pixel" as element of digital imagery prefigured by basic school education in mathematics as "a dot on a grid of squared-paper" (communication Donald McLean, September 2017); turingmachine *squared* tape for reading / writing / erasing discrete symbols (be it black / white dots, as developed in esoteric programmng); "A television system capable of sending 26 brightness levels sends in one second the information content of approximately 2400 pages of print" = Shannon 1948

- different from time-signal resulting from analog scan of Nipkow-disc based electro-mechanical television, transducing visual evidence ("image") into a time-continuous one-dimensional (therfore implicitely "sonic") temporal signal in order to adapt it to a single (instead of parallel) channel of transmission, digital image techno-essentially a space signal; inbetween: Fourier Transform of digital imagery

- classic introductions into analog electronic television describing the electronic image as consisting of "picture elements"; in times of digital media, this leads to misunderstanding that there has been the "pixel" image always already. The one-dimensional, strictly temporally unfolding scan line (be it Nipkow disc, be it the cathode tube electron ray) rather produces variable signal amplitudes (light shades) than discrete elements. Sometimes in Nipkow discs rectangular apertures, different from round drilled holes; even this form never stands still to fix a square unit called pixel (Zeno's "flying arrow" paradox, critically discussed inbetween chrono-photography and the cinematographically induced cognitive illusion of motion, in Bergson, *Évolution créatrice*, chap. 4); "picture element" *topos* / supposition for scan line television nothing but a heuristic simplification to explain (and approximately calculate) the bandwith of transmission ratio, not

an exact description of the technophysical signal event itself; in terms of Fourier synthesis, a "digital" square pulse nothing but a radical approximation, achieved by superimposing sinusoidal waves added in harmonic ratios; remains the Gibbs phenomenon: fuzzy edges; sonic link: tone / frequency equation (Stockhausen, "... wie die Zeit vergeht")

- "there are no 'pixels' in analogue television but there are 'inferred' or 'virtual' pixels as a mathematical artefact of seeking to equate the detail along a line to the picture's line-count when designing an analogue television system" (communication Donald McLean, September, 2017); further: "The 'pixels' analogy may have been originally derived from comparison with half-tone images and then confused with the modern digital sample pixels. That's one possible source as early books show similar samples which don't exist in analogue tv"

Images from data

- media archaeology observing images not iconologically, but with the "cold gaze": as lots of data (once scanned into digital space), thus calculable (rather than akphrastical narrative). "Evidently a different nature opens itself to the camera than opens to the naked eye."[237]; Ernst Jünger, *Der gefährliche Augenblick*

- media archaeology akin to the gaze of the optical scanner; "culture-free images" (Claus Pias); close to radar which is rather a "system of measurement rather than communication" = Woodward 1950: 108, as quoted in: Friedrich Wilhelm Hagemeyer, Die Entstehung von Informationskonzepten in der Nachrichtentechnik, PhD thesis Berlin (Freie Universität, FB Philosophie u. Sozialwissenschaften) 19xx, 341; Radar = analogue imaging technique rendering on-screen the surrounding area of an antenna, while on the level of signal transfer it operates with discrete impulse- and duplex technology. Thus the radar image is rather analytical (a measuring device) than a medium of representation, of projection (like mass media)

- gaze of the camera (Dziga Vertov, "Kinoglaz") or the monitoring system (instead of the panoptical regime: data patterns, clustering, punched cards; poster DEHOMAG Hollerith; "sehende Maschinen"

Physical and logical "space"

- "cyberspace" not cartographic but mathematic, thus *n*-dimensional; each 3-D-navigation on interfaces reduces the n-dimensional potentiality to spatial metaphors. Maps always took place on flat surfaces, depending on their material support for inscription; the crucial quality of digital calculation; mapping metaphor seductive but misleading when it comes to computing; trajectory of a ballistic missile not a function of space any more but of numerical tables; a missile corrects her trajectory "on the fly", by instant

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[237] Walter Benjamin, The Work of Art in the Age of Mechanical Reproduction [1936], in: Hanna Arendt (ed. and introduction), Illuminations, London (Fontana Press) 1973, 238

numerical feed-back

- 3D computer graphics at first glance corresponding with Panofsky's concept of Renaissance "systematic" space which exists prior to the objects. Indeed, the Cartesian coordinate system is hardwired into computer graphics software and often into the hardware itself. When a designer launches a modeling program, he is typically presented with an empty space defined by a perspectival grid, the space that will be gradually filled by the objects. If the built-in message of a music synthesizer is a sine wave, the built-in world of computer graphics is an empty Renaissance space, the coordinate system itself

- still based on referentiality, maps represent real or imagined territories; *Aspen Movie Map* developed by the MIT Architecture Machine Group headed by Nicholas Negroponte in 1978 still based on input taken by photographies of places in real Aspen, Colorado; the resulting interface thus is a metaphor (or rather simulation) of moving in real space. In Geoffrey Shaw´s interactive *Legible city* installation from 1989, urban architecture consists of letters; here, the Gutenberg Galaxy (McLuhan) returns from within the alphanumerical code, a re-entry on the user interface level. The spatial imperative is hardware architecture; alternative model has been developed by Knowbotic Research, for a Tokyo re-building quarter, ideas of "non-located online" - a cloudy challenge to the mapping paradigm

- against the theatrical paradigm of "computers as theatre" (Brenda Laurel), Manovich naming "die Unterschiede zwischen dem isotropen Raum und dem der menschlichen Anthropologie" = 89

- "cyberspace" purely relational; Martin Dodge / Rob Kitchin in *mapping cyberspace* (London / New York: Routledge) 2001, 69 f.; essential for Cartesian grids: mnemotechnical images as technology of knowledge order and memory common in antiquity and the Renaissance are being replaced by numbers on the vertical and horizontal axis - un-iconic; "mapping" therefore taken in its mathematical, topological sense, in order not to confuse imaginary (iconic) with symbolic (indexical) operations in cybernetic aggregates and physical networks. Only computing can actually perform trajectories in *n*-dimensional calculation; really relevant maps have always been hidden, kept secret like the programs hidden behind cyber-spatial interface metaphors of "navigation"; new horizons for search operations in the Media Arts Net: Not just linking images and texts by alphabetical tagging, subjecting images and sound to words and external meta-data once more (the 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

- essential feature of networked computing its dynamic operativity; spatial order biased by "mapping time", that is: mapping temporal, processual operations

- time-critical von-Neumann-computer architecture, dissimulating its operative character in favor of images, maps

- Michel Foucault, "Other Spaces": 19th century dominated by concern with

time; 20th century concerned with space. 21th century concerned with topologies: mathematics, coupled with the materiality of cabels, circuits, processors

- data visualization corresponding with the sublime, making visible the unvisible (Lev Manovich); the "mathematical sublime" (Immanuel Kant)

- installation *Polar* by Carsten Nicolai / Marko Peljhan for the Canon ARTLAB (Tokyo) in 1991, referring to the changing process of inivisible information; idea from the novel *Solaris* by Stanislav Lem (1972): the "Ocean", a sea-like substance of an unknown planet Solaris reflecting human thoughts

- not just visualization of data or metaphorization; (Benôit) Mandelbrot's F fractals not conceived on mathematical grounds; the insight into the correspondence between macro- and microscopic processes originated on the interface figurative level, on-screen; aesthetics as insight; Heinz-Otto Peitgen / Peter Richter, The Beauty of Fractals - Images of Complex Dynamical Systems; visual display of quantitative or quantifiably information a by-product of Cartesian modernity (Tufte)

Sorting / Searching

- search engines as agents of mapping (the generative knowledge machine); not subject sound / images (not even text, considered a stochastic character string) to logo-centristic meta-dating

- use now being made of graphical searching devices on maps. Churches may have the same symnol on maps, but they look different on the ground. The favoured approach here is to "teach" the computer to recognize a type of object = Davies 1990: 154; instead of encyclopedic order: audio-visual search for linkage at random / by similarity, by digital association, connectivism; "iconoclastic" option; types of iconicity: image-like (iconic in its literal sense, graphical similarity); diagrammatic (structural homology, isomophic one-to-one mapping); semantic

- term "semantics" central for Humanities; in information science became a tool to enable automated processing of information not "interpretable" by software agents, beyond the simple listing of controlled vocabulary like in Weizenbaum's ELIZA bot). "Ontology engineering aims at making explicit the knowledge contained within software applications" = ibid.; John Davies (ed.), Semantic Web Technologies. Trends and Research in Ontology-based Systems, Wiley 2006

- mapping as setting objects into relations

- hashing distributed storage

Bit-mapping

- image files containing basically a *bit map*, a long string of bytes, each of

which describes an individual pixel of the image; better "infra-dating"; extracting data from within the image, the sound file; find all edges in a bit-mapped image

- navigation implying the sea: which defies cartography, no territory; rather random; navigation in the Internet / chronometer

- graph composed by knots plus lines: net with one center; loop (each knot linked with two others); tree (hierarchical, thus vulnerable / encyclopedic hierarchy); mesh (each know linked with at least two, mostly more, or each with each linked)

- "According to Ted Nelson time is an important property of links. <...> Information concerning time stamp is a crucial for possible reposition of objects on a digital map and their integration with dynamically changing environment" = Jakub Klust, Linking Mind-maps and Digital Maps with Hypertext, Roskilde University Master Thesis (Autumn 2012) [URL: xxx], 67, referring to: Theodor Holm Nelson. Xanalogical structure, needed now more than ever: parallel documents, deep links to content, deep versioning, and deep re-use. ACM Comput. Surv., 31(4es), December 1999

- data traffic in WWW in discrete packets between server / router locations; no linear transfer, but time-discrete, micro-archival caching at various points; "being-to-death" (Heidegger): packets with stepped TTL (Time To Live) settings . To produce a map of data traffic, tracerouter tool sends out a series of packets with increasing TTL values = Wendy Chun, *Fiber Optics*; cyber"space" principally un-mappable cartographically for its dynamic existence

- elementary functions the condition of possibilities for the computer to start operating at atll (the BIOS for the Operating System) "are burned into silicon and thus form part of the hardware" = Kittler, There is no Software, the autobooting mechanism

- electronic, digital media: mapping movement dynamically, "on the fly" new quality; classical maps could neither be interactive not time-critical; feedback

- mapping as reduction of data complexity; neg-entropical (that is: a cultural technology); "transformation of matter from entropy to information, from a million sleeping transistors into differences between electronic potentials" = Kittler, "No Software"

- representations of the Internet as communication tool (logical nodes) and mapping of Internet showing physical nodes (cables etc.); Internet engineers focus more on logical connections than in questions of human communication; a map of such connections n o t a spatial notion; difference between cultural technique of "mapping" which refers to maps / cartography; as opposed to techno-logical and mathematical use of the term: "mapping one content on another" (German *abbilden*)

New "anarchival" options in re-membering digital images

- flash animation on the website of Berlin conference in 2002 *Searching Images* ("Suchbilder"). By means of the wayback machine which takes regular snapshots of Internet web sites, web site can be traced back at *archive.org*. The text and the image of the website are being kept, while the moving elements within escape the archivizing mechanism; www.suchbilder.de; progressive sorting of distributed pixels according to colour similarity; the algorithms of similarity-based image retrieval; W. E. / Stefan Heidenreich / Ute Holl, Editorial. Wege zu einem visuell adressierbaren Bildarchiv, in: Suchbilder. Visuelle Kultur zwischen Algorithmen und Archiven, ed. same authors, Berlin (Kulturverlag Kadmos) 2003, 9-15

- kind of "anarchival impulse"[238] engendering photography collections in terms of mathematical stochastics once images exist have been translated into the digital regime. In virtual memory space, new options of sorting images arise, different from categorical logocentrism and indexing by metadata, in fact: arrangements which arise from within the digital image itself ("imaged-based image retrieval); different from textual logocentrism and the regime of metadata: image-based image retrieval (stochastic rather than categorical)

- progressive neg-entropic sorting of distributed pixels according to colour similarity; an anarchival or rather para-archival impulse can be identified in the algorithms of similarity-based image retrieval

- instanciation of dynamic image retrieval; IBM search enginge "Query by Image content". QBIC retrieval system for computer-based search for non-semantic aspects of a digital image (a mathematical operation), but can be supplemented by human help (tagging) for the semantic, iconological aspects[239]

- experimental algorithmics different from the well-organized institutional archive. Quantized (digitized) images can be transformed into a vast image bank which, once unified as data-set, can be subjected to image-based search operations such as matching of similarities, object feature detection, statistical colour value comparison etc.; new kinds of search engines not only answering the needs of knowledge retrieval but develop into a creative art of revealing implicit data-"intelligence"

- media arts as avant-guarde in experimenting with new forms of access to image down to its single pixels; strict basis for such experiments still is algorithmic knowledge; nothing "anarchic" in the digital *Forschungskunst*

- image-based search for images taking information itself as criterium in the order of images; loss of material authenticity in technomathematical reproduction in return leads to arriving at another level of abstraction; its

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[238] See the international workshop *The Anarchival Impulse in the Uses of the Image in Contemporary Art*, Museum of Contemporary Art, Barcelona, October 24th, 2012

[239] See Myron Flickner et al., Query by Image and Video Content. The QBIC System, in: Mark T. Maybury (eds.), Intelligent multimedia information retrieval, Menlo Park, CA (American Association for Artificial Intelligence) 1997, 7-21

mathematical intelligence is based on technically standardised, unified alphabets; nothing really anarchic in the digital world, since the alphanumeric regime is always symbolic order

Sorting photography: between image-based sorting of photography and logocentrism

- Heinrich Wölfflin's *Kunstgeschichtliche Grundbegriffe* (1915) aiming at formal criteria for sorting art historical images according to criteria like "open" vs. "closed" form; today, this vision realized by automatic image-based image grouping. Such a clustering sucessively liberates image configurations from word-based *tagging*. Even commercial digital images sorting software for private photographies sometimes offers the display of histograms (diagrams displaying the statistical distribution of colour in images); this is a perfect training in image-immanent navigation of the visual archive.

- tagging and meta-dating of images a supplementary, belated symbolical operation applied to images. Automated sorting of images to a large degree still depends on such annotation: "Computers can help us. But only after we help them first by feeding images descriptions."[240] Since once an image has been turned from a physical carrier into information by the act of digital scanning, is transforms into a mathematical representation devoid of semantics; computer has to be trained in order to gain icono-logical knowledge; to teach the computer human "thinking" has been the dead end of Artificial Intelligence; turn this argument upside down: apparent computational lack, the "semantic gap" which separates the Turing machine from human understanding, as its virtue, since it opens an aesthetics of parametrical sorting and archiving - opening unforeseen spaces of visuality[241]

- in optical scanning, computer not recognizint an "image" in its cultural (thus human) sense, but rather its elementary parameters: statistical colour distribution, edges, lines, shapes et cetera. Stochastic rather then library-oriented, classification-based sorting of images thus becomes feasable. At the same time, digitization of images results in an ultimate addressability of each single picture element, the so-called pixel; adressability is a central characteristic of the archival operation[242]; by digitization the image becomes essentially archival

- transformint cinematographic movies which consist of sequences of discrete photographic frames into a vast searchable data-set

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[240] Lev Manovich, "Metadating" the Image, in: same et al. (eds), Making Art of Databases, Rotterdam 2003, 3

[241] Gottfried Boehm, Jenseits der Sprache? Anmerkung zur Logik der Bilder, in: Hubert Burda / Christa Maar (eds.), Iconic Turn. Die neue Macht der Bilder, Cologne 2000, 45

[242] See Claus Pias, Maschinen/lesbar. Darstellung und Deutung mit Computern, in: Matthias Bruhn (ed.), Darstellung und Deutung. Abbilder der Kunstgeschichte, Weimar 2000, 129

- correctness of computer memory when compared to human remembrance operations which rather distort memories; according to the inventor of the graphical user interface in computing, Licklider (1960), the human is a "fuzzy, noisy device", but in turn gifted with the capability of parallel signal and data processing. From that results a different attitude towards image collections:
- fuzzy computer-sorting makes comparisons of similar (but not identical) images on the basis of new protocols; alternative to "alphanumeric labelling and keywording of pictures <...> aided by re-born analogue machines"[243]; closing the "semantic gap" between the anarchivic element within humans and computing; not training computers to behave counter-logically

- operation of the brain "physically quite analogous to optical processing" itself = P. J. van Heerden, The foundation of empirical knowledge, Wassenaar 1968, 29

- "Memory is transitory."[244] Bush in 1945 formulating his design of a Memory Extender (MEMEX), a memory machine which is not oriented at the artificial taxonomy of libraries but at the human brain functions which operates less logically but associative; by Theodor Holm Nelson was developed into Hypertext practice

Sorting images: *Pockets full of Memories*

- self-organizing map, the Kohonen algorithm[245]; SOM "captures some of the fundamental processing principles of the brain, especially of the experimentally found ordered maps in the cortex"[246]; in terms of informational communication theory *self-organizing map* an adaptive semantic memory model; dynamic, associative, consisting of adaptive prototypes; translating key-words (semantic information) and object description, turning them into numbers; mathematically determined organization happens; metadata influencing the location of scanned objects, for instance, the date, possibly the object's origins = electronic clarification by George Legrady, July 2010

- Legrady's installation *Pockets full of Memories* at the Paris Centre Pompidou in

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[243] Duncan Davies, Diana Bathurst u. Robin Bathurst, The Telling Image. The Changing Balance between Pictures and Words in a Technological Age, Oxford (Clandendon) 1990, 64 f.

[244] Vannevar Bush, As We May Think [*1945], online http://www.isg.sfz.ca/~ duchier/misc/vbush/vbush-all.shtml, 6

[245] See Andreas Teckentrup, Einsatzmöglichkeiten selbstorganisierender neuronaler Netze in der Wirkstofforschung, Diss. Essen 2000; *online* http://www2.chemie.uni-erlangen.de/services/dissonline/data/dissertation/Andreas_Teckentrup/html/teckentrup00.html (accessed August 20, 2012)

[246] Timo Honkela and Juha Winter, Simulating Language Learning in Community of Agents Using Self-Organizing Maps, Helsinki University of Technology, Publications in Computer and Information Science, Report A71, December 15, 2003

2001; visitors invited to first scan personal items and then ascribing values to then by means of a computer touchscreen with a pre-set questionnaire. The resulting values as database then led to the algorithmic placing of scanned objects on the large two-dimensional map.[247] On this visible surface, the "imaginary museum" therefore did not place incoming objects in a pre-existing spatial order but was in constant motion. The real archive, though, hides within the order of the Kohonen self-organizing map algorithm. Against the metaphorical map visible as interface, a different map (as archival diagram) is at work here. What might look like randomness in the dynamic re-placement of visible objects therefore "is not without structure"[248]

- Legrady's installation a mixture of both human (semantic tagging) and inhuman (algorithmic) sorting of images; technologically up-dated version called *Cell Tango*, Legrady (together with Angus Forbes) displaying a projection of constantly changing cellphone photos, first sent by individuals (to pix@celltango.org), and then projected rhythmically over a large, black screen in a variety of patterns. Fresh snapshops swiftly adjust to that mosaic according for formal criteria (image-based matching) and according to their tags (meta-data), mingling with photos taken from Flickr, the photo-sharing web portal. In one of the four modalities of the installation, "Cell_Bin", the most recent images are placed on the black screen first, and an algorithms randomly distributes them. The space left inbetween is successively filled by smaller incoming photographies. This loosely coupled patterns evolve dynamically. In this form of media art, algorithmic information is the artist's main medium[249]

- "Rijksstudio" Amsterdam: user becoming "curator" of the images data bank of Rijksmuseum

- in economy, concept of „chaotic storage"; books of the National Library of Norway are stored and accessed by a speedy robot in a three-dimensional Cartesian grid of book-boxes in shelves

- alternative forms of database that create interesting relations between digital archival records: ImageSorter (genuinely sound- and image-based: color gradient similarities of images)

- sound and images traditionally tagged by textual metadata (the archival inventory); organization of the archive as a database. This belongs to the symbolic order of what is properly called the archive. An alternative is the approach which does not produce metadata for the ordering of such records but sorts them from within which is the signal-based approach. Once can either tag an image by, e. g., the painter's name, or one can treat the same image as

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[247] See Sven Spieker, On the Question of Archives and Entropy in Contemporary Art (Legrady, Muntadas), in: Krzysztof Pijarski (ed.), The Archive as Project. The Poetics and Politics of the (photo) Archive, Warschau 2011, 114-126

[248] Spieker 2011: 117

[249] An argument of George Fifield (Boston Cyberarts Inc.), "Can you see me now?", in: The Boston Globe; online: http://www.wellesley.edu/DavisMuseum/exhibitions/exhibitions_celltango.html; accessed August 2010

complex signal which allows for sorting it according to entropy, colour values or shape detection within

- metadata approach belonging to the familiar archival symbolic regime, whereas the signal approach is truly oriented at the materiality of sound and images; this all becoming more complicated when images are not recorded, e. g., as analog photography or electronic video signals but digitally sampled. This results in a symbolic regime in an even more fundamental sense and re-introduces the archival order. But this fundamental archive of digital sound and images is strictly techno-mathematical and numerical, not metadata in the traditional sense which subjected sound and images to logocentristic key-terms expressed alphabetically.

- self-organizing map (SOM) as core concept of the Kohonen algorithm a mode for similatity-based "signal" approach. George Legrady, in his installation Pockets full of Memories (extended to social web by his up-dated version Cell Tango) combined both approaches: The algorithmic sorting of objects in the media-archaeological way (as self-organizing map) on the one hand, and the subjective, personal tagging of objects by the individual participants (the human approach, focused on emotional semantics)

- Legrady, *Cell Tango*, successively provided and augmented by images sent by cellphones

- *Glocal Similarity Map Engine* von Jet Thorp; http://www.glocal.ca/resources/toolkits/similarity-maps; similarity maps change over time, as more images are added to the pool and more similarities are identified

- spatial aesthetics of collage currently being replaced by operational archival interaction

- gap between the visually associative and the linguistically semantic field opens - retrieval based on similarities (like in Renaissance curiosity cabinets) rather than on archival or library classification: *online* www.suchbilder.de: pixel sorting at work according to colour affinity. In one of the four modalities of the installtion, "Cell_Bin", first the most recent images are placed on the black screen, and an algorithms randomly distributes them. The space left inbetween is successively filled by smaller incoming photographies. This loosely coupled patterns evolve dynamically. This form of media art is called "Database art". Legrady collects the ephemera of everyday life and databases them it in a rather associative than rigid way, combined with a cognitive influence by user tagging. "The images arise and disappear in a hypnotiv rhythm. Tags come up in groups, in a kind of free association. Images that you wouldn't think gelong together somehow link up, leading the viewer down strange narrative pathways" = The Boston Globe review - even non-narratively; contemporary, dynamical version of the rather spatial modernist aesthetics of montage (cut-up) and collage

Temporalizing the archive: From space-based to time-based archives

- photographies "on the line", most literally the cinematographic stripe and reel of celluloid; Aby Warburg's *Mnemosyne* panels functioning "like screens on which the phenomena produced in succession by the cinema are reproduced simultaneously" = Michaud (2004), 262; Philippe-Alain Michaud, Aby Warburg et l'image en mouvement, Paris 1998; basic unit of his picture tables still the photographic frame. With digital sampling of images, all of the sudden photograph can be literally addressed down to the single pixel.

- digitizing photo-chemical images transformation of the material storage into electromagnetic ephemerality and latency. The gain of flexibily and computability, is paid for with a dramatic loss of durability.

- digital photography no material light inscription any more, but its numerical information - as becomes evident when the "core dump" mode is chosen for its representation on display

- in trans-photographical data spaces the message of the medium is the alpha-numerical code; profound mathematization (instead of iconization)

Flexible access to the chrono-archive

- epistmeological notion of "archive" as expressed by Foucault: Which rules govern what kind of photographic memory can be expressed and remembered (that is: stored) at all? It is not only human archivists any more, but in a higher degree than ever it is technologies upon which the readability of such documents depends. The archival record has become techno-mathematical sublime in electromagnetic latency - being there, but not accessible to human senses any more.

- dynamic access; flexibles tools which allow for the coexistence of different orders without destroying the existing database structure

- digital storage of large amounts of photographic objects resulting in new types of transmission, compression and retrieval which are based on differentiation like the send-on-Delta sampling which only registers decisive alterations to sequences of similar images. Dynamic access now replaces the static classification of the traditional logo-centristic catalogue, just like statistical probabilities have replaced particular knowledge in information theory, and pattern recognition replaces individual identification

- chrono-photography performing the time-discrete recording of life itself - but the essence of technical cinematography hidden to human perception

Experiments with the art historical archive: Histogrammatology

- *Active Archive* project of artistic research group Constant applying algorithmic processing of digital scans of the huge photographic archive of the Norwegean avantgarde author Ansgar Jorn; in 1965 Asger closed down his Scandinavian Institute of Comparative Vandalism (SISV), reborn algorithmically: http://sissv.activearchives.org/w/Histograms_in_the_distance; see

http://sissv.activearchives.org/w/Quick_guide_to_the_experiments

- "These digital images are made of pixels rich in color informations, but how can one 'order' by color? What is a significant color information? Contrarily to human intuition, for a computer, a white image is an image saturated with red, blue and green. <...> Ordering is then not only following the raw values coming from the digital objects but already transforming them in dialog with a certain understanding of human perception."[250]

- Is there a non-ocular aesthetic essence of images which can only be *art*iculated by computational (informational) aesthetics? Looking at images the way a scanner does; experimentation with histograms for exploring the digital photo-archive

- Bill Viola's video installation with 20 minutes of just visual noise. But this highly improbable flimmering of electrons on the screen, according to the mathematical theory of communication as developed by Claude Shannon in 1948 as the basis of all our today media communication systems, contains the highest degree of possible surprise; that is why Viola calls his piece *Information*

- Latin *scandere* 'to scan verse'; technical scanner a technological "device trying to mark off verses in digital images, fueling its algorithms with matrices of pixels rather than the metric feet"[251]

- Bill Viola's definition of the electronic video image as "The Sound of One-line-scanning"[252]; a specific temp*aura*lity; Benjamin defines the *aura* as peculiar interlacing of time and space: "Ein sonderbares Gespinst von Raum und Zeit: einmalige Erscheinung einer Ferne, so nahe sie sein mag"[253]

- Photography, literally understood (Herschel / Roland Barthes, *La chambre claire*) as a photonic emanation of an object) "memorizing" rays of light to the viewer in the present - a delayed transfer of what otherwise would have vanished into the dark. This inscribes physical tempor(e)ality into the image. In addition, chrono-photography then performed the temporal archivization of life itself - but the archival essence of technical cinematography is mostly hidden to human perception

Visual im/mediacy: Sorting images

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[250] http://guttormsgaard.activearchives.org, "eleven orderings: guttorm guttormsgaard"

[251] http://sissv.activearchives.org/w/To_scan_and_skim, accessed 11th December 2014

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

[253] In: Walter Benjamin, Kleine Geschichte der Photographie, in: ders., Gesammelte Schriften, edited by Rolf Tiedemann / Hermann Schweppenhäuser, Frankfurt/M. (Suhrkamp) 2nd ed. 1989, 368-385 (378)

- Descartes killing the *ars memoriae* by subjecting the image to the numerical code (Frances Yates, Art of Memory); "digitzation" took place with analytic geometry already

- physical world items, once sampled into digital information units (bits), *telegraphised* - the Nipkow disc television image paradigm; applied to genome sequence and the body: Norbert Wiener, God & Golem, Inc.: A Comment on Cetain Points Where Cybernetics Impinges on Religion [1986], Cambridge, MA (MIT Press) 1986, 36

- In digital culture the essence of the image itself dissolving into alphanumerical data - the ultimate victory of the archaeological alphabet (which, in early Greece, has been used for verbal, geometrical *and* mathematical operations equally.

- Vilém Flusser's definition of the technical image: "Technobilder beruhen auf Texten, sie sind post-historisch"[254]; not an "end" to art history in the linear sense (this would still re-affirm the historical narrative), but a structural *end* as fulfillment in the media-archaeological sense

- computer which "deciphers" images as data-sets. When visual content of museums - once it has been digitized like in Picture Disk editions of art historical works - becomes alpha-numerically addressable, new options of mobilizing the inherent information by intelligent algorithms is possible.

- addressing and sorting audio-visual media content by non-scriptural means with the arrival of fast-processing computers, after digitizing analogue source material, resulting in the unforeseen ability to address not just sound recordings by chunks and images by frames, but every single acoustic or picture element. Images and sounds thus become calculable and capable of being subjected to pattern-recognition algorithms; such procedures not only media-archaeologically excavating but as well generating unexpected optical statements and perspectives from the audio-visual archive that can, for the first time, organize itself not just according to meta-data but according to its proper criteria - media memory from within its own logic (endogenic). Only what is being algorithmically „excavated" by the computer (such as the media archaeology of analog sound recordings which had become inaccessible) is a genuine technological retro-action

- the digitalization of image archives actually liberates the photographic memory from being subjected to external, metadata-based iconographic search operations at all, opening the possibility for image query by images themselves (similarity-based image retrieval)

- light and sound frequencies belonging to the regime of the real; according to Jacques Lacan, the real always returns to its place. This quality is transformed

[254] Flusser Archiv, University of the Arts, Berlin, typescript "Von der Zeile ins Bild (zurueck)", 3. See Vilém Flusser, Into the Universe of Technical images [1985], Minneapolis (Univ. of Minnesota Press) 2011

by the mathematization of the analog signal into the symbolical (algorithmic) regime

- ahistorically, the non-iconological and non-historicist "Petersburg hanging" of pictures according to their formats returning with algorithmic sorting of digital images; cultivate the informative dis-ordering of art history; SOM Legrady, *Pockets full of Memories*

Similarity-based un/order: the pre-modern museum

- calculating similarity as opposed to rigid classification; "early modern version of field theory and chaos theory is Montaigne´s observation that "toutes choses se teinnent par quelque similitude" (similitude binds everything together)"[255]

- "In a world which seemed to present itself as a wilderness of forms, a variety of analogous or synonymous systems could privde the equivalent of a visuel search-engine, much as we search a modern electronic database by finding an exact alphabetic or ASCII match for a tagged semantic item. <...> Dominique du Cange, the sixteenth-century French philologist, suggested (incorrectly) that the words `musaeum´ and `mosaic´ were cognate" - raster scan imaging, indeed. "What all the cabinets and their encyclopaedias share is a syntax of resemblance or identity [...]; their patterns are to be read as comparative contingencies or juxtapositions, as a system of potential *matches*"[256]; media-cultural difference, though, is technological: algorithmicized calculation instead of intiutive human match. "Measurement enables us to analyse like things according to the calculable form of identity and difference."[257]

"Social" archives in Web 2.0?

- with(in) the World Wide Web, emphasis shifting from the storage imperative (in occidental culture) towards on-going transmission and circulation

- photography portal Flickr rather a repository than an archive (in proper terms).[258] "The digital archive is by nature a database."[259] So-called *social media* platforms like Facebook, Youtube or Wikipedia represent rather searchable data banks than archives in its proper sense. Flickr 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)

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[255] Rhodes / Sawday 2000: 13, referring to: Michel de Montaigne, Oeuvres complètes, ed. Albert Thibudet / Maurice Rat, Paris (Gallimard) 1962, 1047, and to N. Katherine Hayles, The Cosmic Web: Scientific Field Models and Literary Strategies in the Twentieth Century, Ithaca, NY (Cornell UP) 1984

[256] Claire Preston, In the Wilderness of Forms: Ideas and Things in Thomas Browne´s Cabinets of Curiosity, in: Neil Rhodes / Jonathan Sawday (eds.), The Renaissance computer: knowledge technology in the first age of print, London / New York (Routledge) 2000, 170-183 (174f)

[257] Foucault, Order of Things, 52 f.

[258] 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)

[259] Pelle Snickars, The Archival Cloud, in: ders. / Vonderau (eds.) 2009: 292-313 (304)

by the content-providers, not on any archival logic. Its archival logistics is rather the underlying algorithmic structure of image database management. Archives of photographic images themselves get in motion[260]

- most image contents still not algorithmically searchable and accessed. The uncalculable is the real challenge to the "digital archive". Most photographic collections in the Web are rather libraries and not itself an archive. Rick Prelinger defines the Internet Archive in San Francisco itself as a "nonprofit digital library"; preservation is neither its mission nor its practice.[261] It is open access which distinguishes such a library (or *musée imaginaire*) from the archive which tends to keep secrecy by definition - like the *protected mode* within microprocessors; Thomas Little, Das PC-Buch: die Hardware und ihre Programmierung, Munich (System Verlag) 1990, 97-107; Friedrich Kittler, Protected Mode, in: Manfred Faßler / Wulf Halbach (eds.), Inszenierungen von Information. Motive elektronischer Ordnung, Gießen 1992, 82-92

From semiotic analysis to "cultural analytics" of the moving image

- in Digital Humanities, the archaeologists of knowledge not exclusively human scholars any more but algorithmic media as well; connected with a subtle shift from cultural (mostly semiotic) analysis of photography to "Cultural Analytics" (in terms of Lev Manovich), that is: computer-based matching

- Matthias Wannhoff, "Finden, was wir nicht suchen können." Ein Versuch in algorithmischer Spielfilmanalyse mittels Cultural Analytics (summer 2012), http://www.medientheorien.hu-berlin.de, section "Hausarbeiten online": statistical (rather than semantic) analysis of huge amounts of grabbed single photographies (of which one special form is films as dissected into single frames) with digital image processing such as pattern analysis and subsequent two-dimensional re-visualisation of such algorithmically calculated data by computer graphics. A new kind of iconology arises, based on logical operations rather than content analysis; method Axel Roch, video *Visualisierung von Texten durch Bilder*

- dominant criteria for the sorting of digital or digitzed (sampled) photographies from within their media essentiality, that is: digital pixel values such as color: "Hue describes the color type, or tone, of the color (and very often is expressed by the „color name"), saturation provides a measure of its purity (or how much it has been diluted in white), and lightness refers to the intensity of light reflected from objects" = Oge Marques, Practical Image and Video Processing Using MATLAB, Hoboken (Wiley) 2011, 398

- describing images with images; Lev Manovich, How to Compare One Million Images?, in: Understanding Digital Humanities, edited by David M. Berry,

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

[261] Rick Prelinger, The Appearance of Archives, in: Pelle Snickars / Patrick Vonderau (eds.), The YouTube Rader, Stockholm (National Library of Sweden) 2009, 268–274 (268)

Basingstoke (Palgrave Macmillan) 2012, 249-278 (263)

- Software Studies Initiative at the University of California in San Diego; a couple of tools, available online; terms derived from statistical mechanics and physical thermodynamics enter which have been adopted for the mathematical theory of information by Claude Shannon et al.: "Hohe Entropie entspricht einer ‚zufälligen' (= wahrscheinlichen), niedrige Entropie einer hoch organisierten (= unwahrscheinlichen) Anordnung" = notes on paper Matthias Wannhoff, presented 1st November 2013, University Library, Amsterdam

- Cinematics software for *Schnittanalyse*; not film frames as basic unit of analysis; *editing* based on gaps between the images

- line diagram can be transformed in ImagePlot; allows for direct addressing of single frames; cp. Roch, "Texte als Bilder als Signale"

- ImagePlot diagrammatic in Peirce's sense: activated in moment of observation which brings temporality in image analysis

- pixel-by-pixel analysis re-chronophotographising film

- evidence of graphs produced by the image processing software ImageJ; how this "reading" of a graph relates to approaches aready established in "non-digital" humanities (hermeneutics, ekphrasis, semiotics)

- *Mapping time in the moving image*; average shot length still regarded dominant parameter in quantifying moving images, see approach developed by film scholar Yuri Tsivian, CineMetrics; data desired by this approach can hardly be gathered automatically by a computer but inevitably requires manual annotation; theoretical deficiency. "Does a frame-per-frame approach to visual data (as doable and automatable through Cultural Analytics) not take the material much more seriously than the abstract counting of spaces (= cuts) between images?"

Dis/order in photographic archives

- with intelligent analytics (algorithms), the photographic (ex-)archive, once sampled into computational numerics, becoming poetic in terms of knowledge and new insights itself, generating new patterns of making use of stored visual evidence

- reverse proportional memory economy at work with photographic archives. Physical storage of the photographic print provides, when being taken care of by professional conservation, a relatively stabile enduring memory, but more difficult to access. Once being digitized, the electronic image is open to almost real time access and new search options like similarity-based image retrieval; at the same time, the "virtual" essence of the electronic image becomes more fragile and subject to alteration than ever

- traditional architecture (*Tektonik*) of the archive based on classificating records by inventories; in the digital media rather sorting records in fluctuation,

that is: dynamic order; this is an "archive" no more, but algorithmically ruled processuality. In such a new order, images can not only be retrieved as contained in their frames, but even by their atomic elements, pixelwise. Thus even what has not been meta-dated at all by human indexing can be automatically retrieved, opening new options of visual memory (be it in photography, be it in film).[262] Such a distribution of image elements does not belong to the library or the traditional archive any more, but builds up a new, mathematized generative principle, thus: an archive in the Foucauldean and Shannonean sense, being based on information itself. This new panopticism is being applied by commercial and military agencies already. New software like Microsoft's *Photo DNA* which allows for the automated idenficiation of - for example - child pornography on websites already indicates by its name that the basis of biological and technomathematical life forms start to converge

- instead of thinking the archive in terms of symbolic order by classification, rethinking it entropically, that is: allowing for a certain amount of signal disorder, which contains, according to communication theory, a higher measure of (possible) information

- rather stochastic "excavation" of knowledge; traditional archaeological "cluster analysis" of burial grounds

The acceleration (temporalization) of the archive

- digital art challenging "the conditions of archiving in our current regime of telecommunications"[263]; photography from the beginning has not just been about permanent fixation of images but as well about immediate transmission; Alexander Bain already in 1844 invented a system for image telegraphy. With photography, the image not only became durable but as well in an antithetical way evanescent - a tendency enhanced by the very nature of the electronic image (*fluxus* in every sense), and in the age of digital media the image becomes coded information in a channel.

- an electronic switch-principle for visual memory for explaining image generation in the brain (esp. in the cortex region): "Auto-associative networks, now under theoretical study by computer scientists, have properties that are comparable with visual memories. You have to imagine a matrix of parallel-switched neurons whose synoptic links react on themselves in loops with the aim of being able to store a great deal of content at the same time <...>" = Schulz ibid., 27

- unlike traditional encyclopedias, *online* Wikipedia updating its entries almost by the minute; radical temporalization of knowledge space transforms the "archive" dramatically, with the new "Web 3" economy being the realtime net

- whole Google architecture reminiscent of an archive. But this is not the

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[262]   Harun Farocki, Arbeiter verlassen die Fabrik, in: Meteor – Texte zum Laufbild, No. 1 (December 1995), 49-55 (50)

[263]   Charlie Gere, New Media Art and the Gallery in the Digital Age; http://www.tate.org.uk/research/tateresearch/tatepapers/04autumn/gere.htm (Herbst 2004)

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)

- dynamic dimension of the web escaping 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 anarchive of the net" = Jakobsen 2010: xxx

New memory options of image retrieval

- scholarly publication of Warburg's *Mnemosyne Atlas* inevitable freezing such dynamic reconfigurations in momentary snapshots; digital publication allowing for combinatorial access to the single elements of such visual tables; van Huisstede 1995: 158: "Wenn es jemals ein Projekt gegeben hat, das in einem elektronischen Medium wie der CD-ROM angemessen zu präsentierten wäre, dann ist es der Mnemosyne-Atlas"

- human and / or cultural memory not accessing images like a visual search machine. It is inevitably rooted in iconological and semantic vectors which in their culturally contextual fuzziness can not be performed by a machine which can only operate with exact data. Even similarity-based retrieval algorithms like the Kohonen Self-Organizing Map (Legrady) would necessarily miss the cultural order of images. Is this quality of Turing machines a defciency to be eliminated by "cognitive" or "neuronal" computing or rather an alternative to be cultivated to enrich the notion of cultural memory by non-human points of view?

- "sorting pixels by colours", a dynamical Flash-animation in operative framing of the former conference *Suchbilder* www.suchbilder.de

Visual im/mediacy: Towards a dynamic technology of photographic (and moving) image retrieval

- expressing digital pictures by numbers undermining the dichotomy between image and meta-data; rather an implosion of images and numbers in digital time

- most extraction in analogue photo archives by grip on the single print, the storage medium only, not accessing its smallest elements

- a digital image still a photographic image? photography a set of signals / data, a format, an „epistemic thing" (Jörg Rheinberger); at what moment does it become an image? By human perception only, or independent from human awareness already within its medium? Without human interpretation of certain visual patterns, the image would just be a cluster of data. Optical signals become information „in the eye of the beholder" only; computer can deal with

the symbolical analysis of physical data only, not with the imaginary

- Foucault's archaeological and archivological analyses autopoietically referring to the alphabet-based world of textual libraries. But "discourse analysis cannot be applied to sound archives or towers of film rolls."[264] What digital space allows for instead is the option of navigating images in their own medium - without changing from visual to verbal language at all. Different from printed letters in a book, the symbols in digital technoscapes are arranged and distributed algorithmically.

- humans irresistably interfacing to photographic images in an iconologic way; search for visual knowledge instead uncovered from within the visual endo-data: entering the image itself (data-immersion), which is the media-archaeological gaze that can be performed by machines of image processing bettern than by human perception. Such *informatized* organization of visual knowledge generates diagrams (which is as well the Deleuzean intepretation of the Foucaultdean *archive*) - infomapping. Our visual culture is still dominated by semiotically iconic, photographic-like images; the twenty first century though allows for genuinely computer-generated visual information, closer to diagrams than to "images", which will eventually take their place and enable unprecedented types of "visual" representations

- computer-based retrieval identifying all edges in a bit-mapped image. Such a „digital image" is an image no more; what looks like images, is rather a mathematical function of data distributions

Inbetween storage, memory and archive

- storage as gesture of setting apart from immediate (con-temporary) consumption of matter, energy or information for later re-use; progressive digitalization of records and online-accessability

- temporalization, that is: acceleration of access and mutability of online image collections counterbalanced by archival restistance against against *streaming data* on the material and structural level. But the archival record can not restist against time, even if in storage it seems time-susended

- photography referring to tempor(e)alities on various levels, ranging from the inherent entropy of the photo print up to the *punctum* as phenomenological affect

- Corbis Corporation's image "archive" located in the Iron Mountain, Pennsylvania; See Jorinde Seijdel, Cold Storage, in: Open 2004, Heft 7 "(No)Memory", 66-77; keeps the physical photographies and negatives of which it commercializes their digital distribution and rights. In the cold technical language of computing *memory* nothing but a metaphor for a kind of storage which is not about remembrance but simply a function of addresses, of loading and intermediary storage, since the original photograph can only accessed

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[264] Friedrich Kittler, Gramophone - Film - Typrewriter, Palo Alto, Cal. (Stanford UP) 1999, 5

digitally any more. Albert Kahn (in the case of his *Archives des la Planète*) "[...] probably did not foresee that the material recorded with the new media of his time – autochromes and films – would become accessible in another medium only. Since most of the shots in the archive only exist in one screening print due to their lack of exhibition, and since the autochromes could only be reproduced through re-photographing, the material has been almost entirely inaccessible until today. The archival imperative of digitization has made the documents accessible only as a world in bits. The FAKIR database, available on the premises of the Albert Kahn Museum, and its small web version Mappemonde <...>."[265] But in less user-interface oriented perspective, the digitized images allow to nagivate their informational content from within, by intelligent algorithms in terms of Digital Humanities research. The power of cultural memory now takes place technologically. Opening new options of dynamical (re-)search, the algo-rhythmicized photo-archive becomes "poetic" in the sense of knowledge-generation itself. Disorder is not just a threat to photographic archives but a chance for a different aesthetics of memory. Once photographies from the past have been digitized, creative new ways of sorting and retrieving images are possible, with algorithm-based criteria such as similarity, pattern recognition, object extraction, shape distribution. Not just being subjected to logocentristic metadata, true content-based image retrieval makes use of the photo-data *from within*, endo-informationally

Archives as non-narrative alternative to historiography

- algorithmic logistics of image orders undercuting the iconologic narrative by discrete counting (alphanumeric metadata); tight coupling of symbolical evidence ("history") replaced by a loose ("mediatic" in terms of Fritz Heider) archival coupling: "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 paradigma, 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

Latency as resistance against *streaming data*

- transitional records; the chemical nature of photography (the temporal gap between expusure and development); "negative" first: latency providing a temporal shelter (Hegelian *Enthobenheit*) against immediate consumation, a chronotemporal an-economy (de-coupled) and a guarantee against permanent transformation: keeping the *monument* (in Foucault's sense)

- better speak of libraries of photography, of "Phototheque"? The archival keeps unique, singular records - like Daguerreotypes. The library keeps multiple,

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[265] Trond Lundemo, Mapping the World: Les Archives de la Planète and the Mobilization of Memory, in: Ina Blom, Trond Lundemo, and Eivind Røssaak (eds.), Memory in Motion. Archives, Technology, and the Social, Amsterdam (AUP) 2017, 213-236 (226)

mass-reproduced printed documents - like Talbotype

- with digitalization of analogue photographic prints or negatives, the original not becoming redundant but is the only way to unhold authentification evidence. Once turned into numerical information, the (former) photographic image looses its touch with irriversible physical inscription, the temporal mark

- undoing historicity, there is media-material transcendence in photography. In medieval Europe, light in cathedrals meant to transcend the material boundaries of architecture. With photographic emanations, light itself becomes a "historiograpical" index (or even media-phenomenologically transcends history by its affect of immediacy on the human temporal sense: preserving the past as present). But still this is not immaterial but bound to a chemical storage medium. *Temporal* transcendence of materiality is a faculty of operative media technologies

The multiple embodiments of the archive

- new kind of archive which emerged within the Internet: its protocols (Galloway); old archive becoming a mere simulacrum ("content") in the digital world and dissolved into dynamic re-ordering; a new "permanent" (or at least stable) *archive* of rules has emerged

- on symbolic level of digitized record management a permanent re-ordering possible in *n*-dimensional space, without changing the conservational actual order to the material records

- parallel to rigid meta-dating (the archival thesaurus and classification), an ever transforming set of adressing records is possible once records exist in digital, that is: mathematicized space: not fixed meta-data there, but permanent metamorphosis

Photography in the archive: between the indexical and the representational

- photography interpreted as an archive itself: "Bertillon sought to embed the photograph in the archive. Galton sought to embed the archive in the photograph"[266]

- between "temporalities" and "tempo-realities"; temporalities of archives referring to the inherent temporal essence (the *Eigenzeit*) of archives as memory institution and storage media, wherease the tempo-realities refer to the function of the archive both *in* historical time and *as* condition (Kantean *a priori*) of historiography

- Henry Fox Talbot in *The Pencil of Nature* explaining plate III (a photography of „Articles of China"): "The whole cabinet of a Virtuoso and collector of old China

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[266] Allan Sekula, The Body and the Archive, in: October 39 (1986), 3-64 (55)

might be depicted on paper in little more time than it would take him to make a written inventory describing it in the usual way. The more strange and fantastic the forms of his old teapots, the more advantage in having their pictures given instead of their descriptions."

- photography subjected to the bibliographic rather than the archival order; "open access" policy of collection (library, museum, data bank) is confused with the strict rule-governed system of the archive, even Alan Sekula in his archivology of photography: "Roughly between 1880 and 1910, the archive became the dominant institutional basis for photographic meaning" <Sekula 1986: 56?>. The bibliographic paradigm ruling photograpic memory organization soon became clear. What looks like the "archive" in a metaphorical sense, turns out to be the order of the library: "At a variety of separate but related congresses on the internationalization and standardization of photographic and bibliographic methods, held between 1895 and 1910, it was recommended that photographs be catalogued topically according to the decimal system invented by the American librarian Melvil Dewey in 1876. The lingering prestige of optical empiricism was sufficiently strong" = Sekula 1986: 56?

- different from the phonographic record which is a storage medium as well, photography not depending on an operative apparatus to articulate its content but can be processed by human perception immediately (without interference of a technical medium of re-generating the registered signals)

- since end of 19th century a new type of records: recording of the (physically) real (indexical photography, phonography and kinematography). But these are non-archival media insofar as they do not operate on the symbolic level like the alphabetically coded traditional historical record.

- how the authority of information can be established or preserved in a new medium; digital photograph or any other document can be "altered" without (almost) leaving a trace of such manipulation; digital "forensics" (Kirschenbaum)

- symbolic order of the alphabetic re-turns, with digital photography, in a new sense: as the regime of the alphanumeric code. The completely coded image replaces signals by arbitrary symbols which can be processed (that is, computed) algorithmically

- photographic "archive" not the photochemical evidence but the metadata, thus: the *paratext* (Gerard Genette), linking the analogue signals to the symbolic regime (writing codes) which is the basis of the historiographical operation. From that archival authority (contextual "situative" authenticity) the photograph derives its authenticity. "The dominant culture of photography did rely heavily on the archival model for its legitimacy. The shadowy presence of the archive authenticated the truth claims made for individual photographs, especially within the emerging mass media" = Sekula 1985: 57.

"Cold memory"? Archival times and different tempor(e)alities of of photography

- "archival time" of photography differing from the temporality of other analog storage media (phonography and cinematography); electronic media (audio and ivideo tape recording) different in every aspect; (almost) immediate (not in the Newtonean, but Maxwellean sense) transmission of light ("live" transmission in "Hertzean" media which are based on electro-magnetic waves) is the reversal of what the permanent registering of light (waves) on photographically sensitive emulsions (the photographic negative) embody

- against discourse analytic deconstruction of photographic knowledge (*studium*), the photographic *punctum* insisting (Roland Barthes); this *punctum* not just of a metaphysical or affective nature, but names as well very literally the tracing of light rays; photographic record the negentropical inscription of one moment of light into a carrier medium; analogue physicality of the photographic print (and its kinematographic twin) thus secures its status as historical record, different from electronic media whose essence is "live" transmission

- electronic image coming into being only by technological operation; "live" transmission the characteristic of electronic (mass) media (radio, television) and at first sight looks like the very oppositive of what the almost immobile archival keeping of records over time ("tradition") is. But storage and immediate data processing are not ontologically different but differ only in scale. Let us compare the photographic moment, i. e. the fixation of a moment in time, to the immediate transmission of an electonic 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 media archaeology of photography itself reveals how the long-time, almost painterly exposure of early Daguerreotypes and Talbotypes by progressing mechanical and chemical means shrinked up to the notable photographic "click" or "shot"

- an anarchival moment (that which escapes the symbolic order of archive-based historiography) as the signature of photographic time, as described by Walter Benjamin as a vertable media-archaeological quality. Photography occasionally provides for an almost Proustean *mémoire involontaire* which escapes all ideological manipulation, an accidental flash of the real

- in photography itself - its temporal *momentum* - the auratic moment (in Benjamin's sense) resides

- no "noosphere" in terms of Teilhard de Chardin at all: "Es ist ja eine andere Natur, welche zur Kamera als welche zum Auge spricht; anders vor allem so, daß an die Stelle eines vom Menschen mit Bewußtsein durchwirkten Raums ein unbewußt durchwirkter tritt" = Benjamin 2002: 303. Of such an optical unconscious ("Optisch-Unbewußten" = Benjamin ibid.), the observer becomes aware by photography only

- Photographies not by themselves differentiating between the significant and the asignificant in their referents ["die Unfähigkeit fotografischer Bilder,

zwischen Wesentlichem und Unwesentlichem unterscheiden zu können"[267]]

- non-hermeneutic essence as media-archaeological virtue (not deficite) of photography as media technology, as coined in Charles Sander Peirce's semiotic as *index*. This is closer to the signal than to the sign (in terms of the "referent"), and rather a contingent, pre-symbolic, thus: an-archival trace.

- Henry Fox Talbot explicit in the introductory words to *The Pencil of Nature*, stressing that the photographic plates therein „have been formed or depicted by optical and chemical means alone, and without the aid of any one acquainted with the art of drawing", and media-archaeolgically radicalized the rupture with the poetics and rhetoric of mimesis, semantics and hermeneutics of images is being defined: "The picture, divested of the ideas which accompany it, and considered only in its ultimate nature is but a succession, or variety of stronger lights thrown upon one part of the paper, and of deeper shadows on another."[268]

Timeless? Entropic *versus* digital photography

- "archival" seduction of historical imagination by photography, the referential illusion of the past moment "as it actually was" (Ranke); media-archaeological gaze tries to resist, by looking at the tempo-reality of the medium itself

- archives emerging with the symbolical code of writing; symbolical code can be transmitted (now "migrated") with a high degree of fidelity in copying, regardless the material support; symbolical code (like the genetic code), esp. in the alphabet, mostly invariant towards historical, i. e. entropical time. Digital data, which is: "information", *per definitionem* (Norbert Wiener) are neither matter nor energy[269]

- authenticity in photography does not depend on the external archival frame of reference but its photographic indexicality

- tempor(e)alities of the archive; looks like a time machine. Can photography provide a direct contact with a reality of the past? In a physical sense, this is true for chemistry-based photography indeed, as expressed in a writing on conservation of photography in museums: "fragile links of silver to the sunlight of our past"[270]

- archive's status as mnemonic device manifold: on the one hand, as a certain

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[267] Volker Wortmann, Was wissen Bilder schon über die Welt, die sie bedeuten sollen?, in: Authentizität. Diskussion eines ästhetischen Begriffs, Munich (Fink) 2006, 163-184 (180)

[268] London 1844; Reprint New York: DaCapo Press 1969, no page

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

[270] Carney E. S. Gavin, Photo-archaeology and tomorrow's museums: fragile links of silver to the sunlight of our past, in: Museum (Unesco, Paris), vol. XXXVII, No. 1, 1985, 5-12

technology of representation, on the other hand revealing its relationship with a certain modality of the past that constitutes its material basis

- indexicality of photography is a quality of its media-archaeological existence: physically being an inscription of light conserved chemically. Indexical: the physicality of the storage medium

- when being looked at not media-archaeologically but as part of historical research, photograph immediately subjected to contextual knowledge, transformed from media-archaeological monument to discursive document.[271]

- "Evidently a different nature opens itself to the camera than opens to the naked eye."[272]

- in English translation, Benjamin's term "technische Reproduzierbarkeit" turning into "mechanical reproduction", thus unwillingly reminding of the difference which opens with digital reproduction: a mathematization of the photographic process, a different archive. Media archaeology is about the mathematical / symbolic logic as well, not just about engineering in the traditional sense any more.

- mechanical (and then techno-mathematical) gaze opening an archive by making visible to humans what otherwise escapes the human optical sense: photo-micrography and the dynamical time axis manipulation by photography (chronophotography, slowing down and fast forwarding of motion).[273] The archive of different temporalities opens, "declassifying" time-deferred worlds: an world of what has been hidden (*secretum*) while existing nonetheless - photo-*aletheia*. Technical *poiesis* in the sense of ancient Greek *techné* as re-defined by Martin Heidegger; both artistic and technical creations modes of bringing forth, interrelated within the machine[274]

- for Ernst Jünger, optical technology creating an aesthetic of detachment, the only mode of perception that can be commensurate to the incursions of technological shock in everyday life. Photographic detachment neutralizes social pain, for the photograph "stands outside the realm of sensibility. It has something of a telescopic quality: one can tell that the object photographed

271 An argument in Michel Foucault, Archaeology of Knowledge, transl. A. M. Sheridan Smith [*1972], London / New York (Routledge Classics) 2002, "Introduction", 3-19 (7 f.)

272 Walter Benjamin, The Work of Art in the Age of Mechanical Reproduction [1936], in: Hanna Arendt (ed. and introduction), Illuminations, London (Fontana Press) 1973, 238

273 See Emely Godbey, The cinema of (un)attractions: microscopic objects on screen, in: John Fullerton / Jan Olsson (Hg.), Allegories of Communication. Intermedial concern from cinema to the digital, Rom (John Libbey) 2004, 277-298

274 Martin Heidegger, Poetry, Language, Thought, trans. Albert Hofstadter, New York (Harper and Row) 1975, 64. See Malin Wahlberg, A Relative Timetable. Picturing time in the era of new media, in: John Fullerton / Jan Olsson (Hg.), Allegories of Communication. Intermedial concern from cinema to the digital, Rom (John Libbey) 2004, 93-103 (101f)

was seen by an insensitive and invulnerable eye. The eye" - different from Zeno's paradox - "registers equally well a bullet in midair or the moments in which a man is torn apart by an explosion" (Jünger 1989: 208)

- "PHOTOGRAPHY was the mechanization of the perspective painting and of the arrested eye"; "Telephone, gramophone, and RADIO are the mechanization of post-literate acoustic space"; "We are back in acoustic space"[275]; such sonic space is understood here as the epistemological existence of sound

- a JPEG file on hard drive. "There's visual information there, but it cannot be *seen* until interpreted by a piece of software that projects or prints an *image*" dynamically = Richard Beaudoin / xxx Kania, A Musical Photograph?, in: *Journal of Aesthetics and Art Criticism*, xxx, 122, closer to musical performance / zigzagging of eye scanning an image / eye-tracking / systematic scanning of image by electronic camera

- "visual detachment of the Gutenberg galaxy opposed to the full sensory involvement of pre-Gutenbergian manuscript cultures; latter are said to be "intensily audile-tactile compared to print culture; and that means that detached habits of observation are quite uncongenial to manuscript cultures <...>. In place of cool visual detachment the manuscript world puts empathy and participation of all the senses" = Marshall McLuhan, The Gutenberg galaxy. The making of typographic man, New York (Routledge) 1962, 28

Archival nostalgia? The analog photographic print

- Oliver Wendell Holmes 1859 on photography of the cathedral Nôtre-Dame in Paris: "Form is henceforth divorced from matter. [...] Give us a few negatives of a thing worth seeing, taken from different points of view, and that is all we want of it. Pull it down or burn it up if you please. [...] Matter in large masses must always be fixed and dear; form is cheap and transportable" = Oliver Wendell Holmes, The Stereoscope and the Stereograph, in: Atlantic Monthly (1859) H. 3, 733-748 (747); Jens Schröter, Die Macht der Stillstellung. Zur technologischen Abtastung und Verfolgung am Beispiel der Fotografie und des Computers, in: Andreas Gelhard / Ulf Schmidt / Tanja Schultz (eds.), Stillstellen. Medien - Aufzeichnung - Zeit (Zeiterfahrung und ästhetische Wahrnehmung, vol. 2) 2004, 60-74; symbolic trade-off between recording media and physical matter. "From now on, form is separated from material. In fact, the material in visible objects is no longer of great use, except when being used as a model from which the form is constituted. [...] the result of this development will be such a massive collection of forms that it will have to be arranged into categories and placed in great libraries" = quoted here from: Wolfgang Kemp, *Theorie der Fotografie I (1839–1912)*, Munich, 1980, 121; *Ge-stell* (Heidegger) of storage of these forms is, in an epoch that has brought about an audio-visual memory, no longer the library. In place of fixed order, sampling allows for the digital storage and manipulation of tones and sounds, images and glimmers

- photography once time-analogue in terms of optical indexicality; with digital sampling, open for mathematical intelligence. Analogue photography by its

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[275] McLuhan, "Five Sovereign Fingers Taxed the Breath" (1954)

very materiality inscribes traces of time, whereas in digital photography, the temporal index becomes a stamp, a date without physical evidence of aging.

- notion of "digital photography" metaphorical when perceived by human eyes; a former single physical medium like the photographic image as print does not exist behind the surface of computer interfaces but as a data format, an array of bytes which are adressed and processed algorithmically

- by November 1946, single bits stored (and permenently changes or refreshed) on the screen of a standard radar CRT. With the Williams-Kilburn Cathode Ray Tube memory in early electronic computing, each phosphor charge, on and off, not only represented but embodied a binary "zero" or "one". This is not video art but functional TV. Since the charge would decay within 0,2 seconds, a detector was placed in front of the CRT, obstructing human insight, allowing for an electronic beam again to refresh the charge just in time to keep it.[276] The actual observer, here, is the computer itself. In a canonical artistic engineering demonstration from 1947, the CRT was made to self-express its own number of digit capacity: "2048 DIGIT STORE". For once, the relation between dislay and computer has been not metaphorical but indexical.

- in current media art, the "archaeological" use of anachronistic media like 16mm film like a retro-effect against digital atemporality - an archaic counter-practice, archival resistance; Malin Wahlberg, A Relative Timetable. Picturing time in the era of new media, in: John Fullerton / Jan Olsson (Hg.), Allegories of Communication. Intermedial concern from cinema to the digital, Rom (John Libbey) 2004, 93-103

- digital photograph preserving the iconic quality while loosing the indexical trace. Or rather, indexicality itself here is of a different kind. While the analogue photographic print keeps a physical trace of the past, recording the light intensities, the digital pixels keep a schmatic, mathematically abtracted relation to their generating (and then sampled) analogue signals - a *diagrammatic indexicality*

- multi-media "archive" representing an operative diagramm, a diagrammatic machine, still topological (graphs, nodes) but with the additional dimension of temporal processes

- Vilém Flusser: mechanical code (formatting by the apparatus) obtained that comprehends images. This leads one to activate the code and to create new images out of the code language[277]

Historicism and photography

- photographies from the past: the contingent might, from a later point of view, become more important than the originally intended referent - like the tree for historical climatology. It is the contingent which short-time photography is able

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[276] R. B. E. Napper, in: Rojas / Hashagen (eds.) 2000: 366; Fig. 1
[277] See   Vilém Flusser, Für eine Philosophie der Fotographie, Göttingen (European Photography) 1984

to catch with diminuishing time of exposure, flash-like images[278]

- Lessing 1766, notion of the "transitory"; Laocoon; or the limits of poetry and painting, transl. William Ross, London (Ridgway) 1836; chap. III, 28: All representational arts "are necessarily restricted by its material *limits* to a single instant of time." This holds true for traditional art, even more to photography, but the instant, in photography, ranges from the punctual micro-moment to long-time exposure, thus extending the presence

- photography catching interval as temporal mediality ("inbetween"): from long-time exposure (for techno-chemical reasons) to catching a moment, archiving an instant of time, a dramatic, time-critical escalation

- differentiating the punctual temporality of photography from the processual temporality of the electronic image

- technological reproduction media with presence-generating power over human perception of time, resulting in a cognitive-affective gap within humans between historical contextualisation and temporal appeal: "In <...> sound recording the men and women of the past are present. Marcel Proust makes me think *of* bygone times. When I hear Kirsten Flagstad as Isolde, with the Royal Opera House Orchestra under the leadership of Sir Thomas Beecham, the voice of the opera legend is concretely present to my ears. The intellect tells me that the recording is 72 years old and stems from Covent Garden, but for my senses, she is with me in space, here and now" = Jakobsen 2010: 6

- on 16th August 2010, a postcard finding its destination into mail box, sent from Southern France, Aix les Bains; postcard reproducing an ancient photograph with yellow-brownish colour: L'entrée du Casinao "Grand Cercle", from the postcard series entitled "Image d'autrefois". What does it mean, this *autrefois*? very term expresses a difference to what is considered as historical time, rather displaying a chronotopical time (Bachtin), or a heterotopical time (Foucault)

- the photographic event; Roland Barthes, in *La chambre claire*, defining the *studium* of photography as the cognitive reading of a photography, taking it representational: as part of a given historical context and a given cultural code. But this documentary reading is broken by a medium-specific energy of photography: the *punctum*, an affective impuls which "like an arrow" (Barthes) cuts through the contextual, historicizing reading, like a *stigma*. Barthes calls it "a little hole" - as if the Lacanean *real* opens hier, for a moment/um (both a temporal and an epistemic moment, an eventuality of temporal suddenness, closer to the digital impulse)

- media archaeology, after Foucault, describing the non-discursive practices of the techno-cultural archive; media phenomenologists analyzing how phenomena in various media appear to the human cognitive apparatus (mind and senses); Wendy Hui Kyon Chun / Thomas Keenan (eds.), New media/old media. A history and theory reader, New York (Routledge) 2006, 3 f.

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[278] Walter Benjamin, <Über den Begriff der Geschichte>, in: ders., GS, xxx

- tracing shadows (like Etienne de Silhouette did) in a way that follows the physically (or in Lavater´s ambition: physiognomic) given rather than pictorial conventions (like painterly portaits) opening a fundamentally different regime of signal processing. Fidelity of translation ("une tradiction littérale" writes Barante) - culminating in the daguerrotype which "automated" visual translation = Bann 1974: 91, 95 f.

- the non-discursive elements in dealing with the past: not the speaker´s agency, but rather the machinic agency; cp. Bann 1995: 80. While Ranke´s historiography tried to efface the speaker´s marks in order to let an objective "pastness of the past" appear = ibid., technical media do this. The camera eye deplaces the subjective vision - which allows for a sharpened reading of count Paul Yorck von Wartenburg´s comment on Ranke´s historiographical aesthetics as "ocular" = letter Paul Yorck von Wartenburg to Wilhelm Dilthey dating from 6th July 1886: "Ranke ist ganz Auge als Historiker, <...> es ist ein Geschichte sehen <...> Ranke ist ein großes Okular", as quoted by Martin Heidegger, *Sein und Zeit*, Tübingen, 1980, 400; artefact of the camera objective enters the stage. "Bloss sagen, wie es eigentlich gewesen": Leopold von Ranke, Preface to his *Geschichten der romanischen und germanischen Völker von 1494 bis 1535* (1824), VI; implications of this phrase discussed in: Stephen Bann, The Clothing of Clio. A Study of the Representation of History in Nineteenth-Century Britain and France, Cambridge (Cambridge UP) 1984, 8 ff.

- William Henry Fox Talbot, The Pencil of Nature, London, 1844, and H. D. Gower / L. Stanley Jast / W. W. Topley, The Camera as Historian, London, 1916

- the panorama (1808 Schinkel displays in Berlin his panorama of Palermo) and diaphanorama (Frank Niklas König); 1822 Louis Jacques Mandé Daguerre opens his first diorama in Paris, while Joseph-Nicéphore Nièpce´s first experiments with photographic representation (dating back to 1822) would hardly have been known to Ranke; inbetween dividing line between techniques of visualizing history scenically and the strictly technical medium of photography

- with emergence of photography, the theatrical gaze of "staging the past" (to quote another chapter from Bann 1995) displaced by the cold machinic eye, a technically neutral code instead of a subjective discourse. The vanishing point in perspectival pictures (and successively media like photography and film) since the Renaissance has been a literally *theoretical* formalization, even mathematization of the subjective betrayer (the "I/eye"), an exteriorization of the human eye by technical optics. "As McLuhan and others have suggested, the simultaneous development of perspective theory and printing technology imposed an increasing degree of abstraction upon Western systems of communication, substituting an idealised `vision´ for the close conjunction of visual and haptic skills which characterised <...> the reading of a medieval illuminated manuscript" = Bann 1990: 116. Finally photography (as notoriously explained by Roland Barthes) annihilates the distance between *Dasein* and *Dagewesensein*, the gap between past and present <Bann 1978: 264> - this has actually been ("ça a été"[279]). At the same time - and here enters Stephen Bann the artist - a photography documents exactly the absence of this

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[279]   Roland Barthes, *Die helle Kammer*, Frankfurt, 1985, 90; orig. *La chambre claire. Note sur la photographie*, Paris, 1980

particular moment which has passed. Together with Bob Chaplin Stephen Bann created *A Mythic Topography*, a series of prints such as "Jullieberry Downs. The Absence of the Past"[280], a diptych displaying the photographic presence of a landscape devoid of evident historical marks but receptive for the injection of historical imagination which can fill that gap - thus the visual evidence is a "cold medium" of the past as opposed to "hot" historiography (Marshall McLuhan's distinction in *Understanding Media*)

- as long as representation of colour not available for photography (until around 1900), new medium remained rather on the side of archival, text-based and thus black & white - printing page aesthetics of registering the past coldly - as opposed to painterly anmination and historical imagination.

- photography's mnemic energy does not reside upon the presence of a spectral referent, but in the physical event: Rays of light, which emanated once from a real object, touch the viewer upon regarding the picture; Wolfgang Beilenhoff, Licht - Bild - Gedächtnis, in: Anselm Haverkamp / Renate Lachmann (eds.), Gedächtniskunst, Frankfurt/M. (Suhrkamp) 19xxx, 444-473 (447)

- beyond rhetoric of metonymy or synecdoche, the chemical essence of photography indeed registering the physical trace of light beams which one illuminated the photographic plate

- photography performing what Foucault claims in the introduction of his *Archaeology of Knowledge*: suspending the past from historical discourse (which is always anthropomorphic), in order to make source data accessible for different configurations. When literary strategies of historiography are being replaced by "an appropriate technical means for signalling the purity of the historical code" = Bann 1978: 263, the rhetoric of media (which is a technical figure of *dissimulatio artis*, a dissimulation of the mechanistic) substitutes the former episteme. In the same manner like history in Romanticism became seemingly real "through the fiction of the transparency of historical discourse" <Bann 1978: 263>, the blueprint for media set

- historian's ambition to let the archival record speak for itself; visual equivalent in the notion of an unmediated registration of the reality of the past" = Bann 1995: 127 f.; no representation ever un/mediated. Like the rhetorical *dissimulatio artis* in Ranke´s historiography which aims at an apparent self-expression of history, technical media make forget their technical operativity on the machine-to-human interface in order to let the illusion of pure "content" appear; only in a moment of technical break-down the medium becomes visible

- illusion of lifelike presence in the museum, corresponding with the "photo-realistic" idea of an unbiased historiography; referential illusion of a possibility to "live the past" created; Stephen Bann, Living the Past, in: Bann 1995: 130-162 (146)

- photography not only the object of research of media archaeology, itself a media-archaeological way of remembering the past in a way radically

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[280] Referring to Hilaire Belloc, *First and Last*, London (Methuen) *1911, 3rd edition 1924, "The Absence of the Past", 48-52

alternative to history. All of the sudden, the historians´ desire to preserve the original sources of the past becomes true - for the sacrifice of the discursive

- the camera as detached observer. Past, archive and history fall apart, as different registers and regimes; technical media do not really belong to the semiotic regime at all, rather to signal processing).

- technical difference between the French Daguerrotype and the British Talbotean negative/positive-technique corresponds with two different discursive emphases: "Daguerre (the showman of the diorama) exemplifies the notion of the photograph as `fairy work´, in the sense of projection into an imaginary space <...>. Fox Talbot (at any rate with his initial, `photogenic´ process) emphacises the possibility of `close contact´, of an indexical link between the image and its referent" - in fact a reproduction with a (in itself technically time-crucial) "signature in time" <Bann 1984: 134>. The former antiquarian phantasma - the direct touch with the past via the archaeological fragment"[281] - is being automated

Dis/order in photographic archives

- once digitized, electronic image open to almost real time access and new search options like similarity-based image retrieval; at the same time, the "virtual" essence of the electronic image becomes more fragile and subject to alteration than ever

- traditional architecture (*tectonics*) of the archive based on classificating records by inventories. This is being replaced in the digital media by order from fluctuation, that is: dynamic order. *But this is an "archive" no more*, but algorithmically ruled processuality.

- digitally sampled into the symbolic order, images not only be retrievable as contained in their frames, but even by their atomic elements, pixelwise. Thus even what has not been meta-dated at all by human indexing can be automatically retrieved, opening new options of visual memory (be it in photography, be it in film).[282] Such a distribution of image elements does not belong to the library or the traditional archive any more, but builds up a new, mathematized generative principle, thus: an archive in the Foucauldean and Shannonean sense, being based on information itself. This new panopticism is being applied by commercial and military agencies already. New software like Microsoft's *Photo DNA* which allows for the automated idenficiation of - for example - child pornography on websites already indicates by its name that the basis of biological and technomathematical life forms start to converge.

- new electronic media like video appearing like being integratable smoothly into the traditional archival system. But in themselves they already represented a radical alternative to archival order.

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[281] See Stephen Bann, Clio in parts, in: Perspecta. xxx
[282]   Harun Farocki, Arbeiter verlassen die Fabrik, in: Meteor – Texte zum Laufbild, Nr. 1 (Dezember 1995), 49-55 (50)

- nostalgia for archival order a phantasm surviving from the age of print. The alternative is a media culture dealing with the virtual an-archive of multi-media in a way beyond the conservative desire of reducing it to classificatory order again. Data trash is, positively, the future ground for media-anarchaeological excavations; on recycling: the Redundant Technology Initiative (http://www.lowtech.org) and Mark Napier´s www.potatoland.org

- instead of thinking the archive in terms of order by classification, we have to think entropically, that is: allowing for a certain amount of disorder, which contains, according to communication theory, a higher measure of (possible) information

- entropy - the conceptual enemy to the traditional archive as authority of tradition - not just the negation of order but rather its alternative, "an organizing principle of disorder" that all of the sudden makes sense when observed from on high = Richards 1993: 86 f.; such analysis oscillating between the micro- and the macrophysical level and results in cultural and even political aesthetics. Cloud modelling (developed for weather forecasting) is the name of the challenge to answer this anarchivic dynamics by fast calculation

- nostalgia for archival order surviving from the age of print. The alternative is a media culture dealing with the virtual an-archive of multi-media in a way beyond the conservative desire of reducing it to classificatory order again. Data trash is, positively, the future ground for media-anarchaeological excavations

The acceleration (temporalization) of the archive

- conditions of archiving challenged by current regime of *online* communication; photography from the beginning not just about permanent fixation of images but as well about immediate transmission; Alexander Bain already in 1844 invented a system for image telegraphy. With photography, the image not only became durable but as well in an antithetical way evanescent - a tendency enhanced by the very nature of the electronic image (*fluxus* in every sense), and in the age of digital media the image becomes coded information in a channel.

- in terms of an auto-associative network, an electronic switch-principle for visual memory is being discussed for explaining image generation in the brain (esp. in the cortex region):

- auto-associative networks, in computer science, with properties comparable with human visual memories. "You have to imagine a matrix of parallel-switched neurons whose synoptic links react on themselves in loops with the aim of being able to store a great deal of content at the same time" = Schulz ibid., 27

Image archives on the threshold of their digital approachability

- visual search engines dealing with "semantic" queries still in their infancy;

crawling the web for illegal trade-mark copying. "Search & destroy": Let us not forget that „the similarity-based images retrieval technology is either militarily or commercially, not really culturally driven" (Lev Manovich). In his film called *Eye / Machine*, the film maker Harun Farocki draws our attention to *operative images*; so-called intelligent weapons become data-driven by matching images, not pre-directed by meta-data any more

- iconological heritage and cultural semantics hindering analysis of imagery; rather Manovich's "visual analytics" (Digital Humanties). "Humans are much better than computers at extracting semantic descriptions from pictures. Computers, however, are better than humans at measuring properties and retaining these in long-term memory. On of the guiding principles used by QBIC is to let computers do what they do best – quantifiable measurements – and let humans do what they do best – attaching semantic meaning" = Myron Flickner et al., Query by Image and Video Content: The QBIC System, in: Maybury 1997: 7-22 (8) - which establishes a feedback-loop between man and machine and stages the difference between analogous and digital data processing, thus not trying to efface, but to creatively enhance the human-computer-difference where they meet on the interface

Visual archiving: Sorting and storing images

- image processing within computers radically differing from the iconological / logocentric semantics of cultural vision

- algorithmically "intuitive archives" (SOM / Legrady); modelling similarity, alternative to meta-data annotation; query by visual example; automatic feature extraction; not replicate human behaviour

- microblogging platform www.tumblr.com for photo, text and video as anarchival order clustering in current media culture: throw images into the computer and see how he, the computer, orders it; adjust humans to understand computer perception

Moving image retrieval

- basic unit of video to be represented or indexed usually assumed to be a single camera shot, consisting of one or more frames generated and recorded contiguously and representing a continuous actionin time and space. Thus, temporal segmentation is the problem of detecting boundaries between consecutive camera shots; definition of a suitable *quantitative* difference metric which represents significant *qualitative* differences between frames = Zhang et al. 1997: 142

- truly "image"-based retrieval of digital image banks; using statistical object modelling techniques (so called Hidden Markov Models, probability scores which are deformation tolerant), i. e. the user searches an image database intuitively by applying simple drawings, sketches

- options (beyond archival meta-data) of re-arranging "found footage" in

algorithmic ways, as opposed to the idiosyncacies of previous filmmakers; technology of the cinematographic apparatus for cutters / the completeley different electronic video image; not taken as simply "zuhanden" in hermeneutic analysis; media archaeology aims at openng machinery as "vorhanden"

- visual archive rather as a CD-ROM which can be read/seen vertically and horizontally, i. e. paradigmatically and syntagmatically, different from the linear reading of analogue film and video

Excavating the cinematographic archive by algorithmic im/mediacy: digitally counting (with) moving image retrieval

- Steenbeck / AVID editing devices ("analog" / digital) the hidden "time" machine of the film event, its cuts / montage hidden behind the apparent narrative

- with film, enters a different aesthetics in the succession of images techically, to achieve the illusion of continuity in time and space; actual cuts are dissimulated; Karel Reisz, The Technique of Film Editing, New York 1968; differences in image (frame) sequences can - by cutting - result in coherent units of perception; allows for non/linear searching films according to these rules of organization of images

- digitizing every fifth film frame and letting his program arrange the iconic data bank according to pictorial similarities, identifying and counting with differences of objects (shapes, colors) in digitized images. While the single film frame becomes two-dimensional pixel format, their sequence results in three-dimensional vectors (Knuth 1973); extend Quadtrees unfold to Octrees, from 2^2 to 2^3 branchings per knot (Samet 1990); mathematical transformations (Fourier or Wavelet) rather differentiate than recognize images according to similarities

- digital visual archive calculable, literally counting images by numbers not only externally (as suggested by Peter Greenaway in his experimental film), but internally as well. To play a bit with German words: The digital image-based archive will be accessible only in a media culture which is not tempted to defigure archival memory by historical narratives (*Erzählung*), but by counting (on) it (*Zählung*); rhetorical tradition of iconic *ars memoriae* displaced by Cartesian analytic geometry which replaced images by numbers (Frances Yates); addressability not simply of single photographic frames but down to every single pixel in an image (or image sequence) once it is digitized; media archaeology focuses on this decisive rupture in how to approach image - from cultural memory to discrete archive

- expressing pictures by numbers undermines dichotomy between image and meta-data; rather an implosion of images into algorithmic space

- "Digital Computers introduce a consideration not found in kinematic analog computers, namely, the ordering of computation steps in time. In a vague

sense, therefore, digital computation is dynamic in character" = Stibitz 1942b, 3 - all the difference between the physical meaning of "energetic" and "kinetic", equalling impulse vs. wave

- kind of second-order visual knowledge, cartography, diagrams - infomapping; visual culture still dominated by semiotically iconic, photographic-like images in the twenty first century; genuinely computer-generated visual information, closer to diagrams than to "images", eventually takes their place and enables unprecedented types of visual representations; Constant Active Archive initatives

- aesthetics of image-based image retrieval based on visual patterns rather than verbal metadata, "read" by computer scan / algorithms in a way familiar to premodern order of things (Foucault): "as comparative contingencies or juxtapositions, as a system of potential *matches*" = Claire Preston, In the Wilderness of Forms: Ideas and Things in Thomas Browne´s Cabinets of Curiosity, in: Neil Rhodes / Jonathan Sawday (eds.), The Renaissance computer: knowledge technology in the first age of print, London / New York (Routledge) 2000, 170-183 (174 f.)

- www.suchbilder.de: pixel migration, matching by colour similarity values