[ON PHONICITY]

PHONETIC ANALYTICS
Case study: "Lautarchiv", Humboldt University
"Short dictaphone bio"
Lautarchiv *analytics*
Technological analysis of phonetic recordings
Case study: Kurenniemi a(r)chi(e)ved with Constant
Listening to magnetic tape recordings
Frequency analysis: Popular music as technical memory

GUSLARI *ON-LINE*
Electrified memory
Transcription *versus* technical recording
Rescuing the ephemerality of sonic articulation from "historic" time: symbolic notation and signal recording
The Wire Recorder (technical description)
Technical recording vs. symbolic transcription (Bartok)
Discovering sub-semantic poetic articulation: Interpretation by measuring
Novi Pazar trip report
Computerprints for Albert Lord, MPC 1982
Homeric Singing - An Approach to the Original Performance (Danek)
McLuhan on Parry / Lord
Technologies for uncovering the correlations between oral poetic articulation and senso-motoric instrument feedback

THE PHONOGRAPHIC APPARATUS
Inbetween the present and the immediate past: acoustic delay
Phonography: Recording the volatile
Phonograph *versus* magnetophone: Electronics makes a difference
Technological memory: The sound of the phonograph itself
The Aluminium disc
Lord's Wire Recorder

TECHNOLOGICAL WITNESSING OF POETICAL MEMORY: GUSLARI *ON-LINE*
Re-discovering the sound of texts: "Oral poetry"
Technically induced "secondary orality"
Retextualizing audio(visual) records: Digitized sound
Re-discovering the sound of "texts": Oral poetry
Speech becoming "immortal"
Trans-cultural musical memory? A techno-cultural paradox driven by traumatic "future in the past"
Disembodied voices from analog to digital analytics
Singers and Tales in the 21st Century: digital memory
P.S.: Re-play (Hamdo 2006)
[Archival phantasms / auditory hallucinations]
[Motion and immobilization: the audiovisual archive]
Reverberative memory

TOWARDS A MEDIA-ARCHAEOLOGY OF SIRENIC ARTICULATIONS
Time Shards (in the media-active test)
Siren songs

Locating the Sirens

TECHNOLOGICAL VOICING OF TRAUMATIC MEMORY
Technological de-humanizing of oral testimony
"Bad recording" of beautiful voices
Let the medium speak: ghost talk

ARCHIVING AUDIO-PRESENCE
Techno-traumatic irritations
Archiving Presence: From Analog to Digital
Techno-Trauma: From Analog to Digital
"Prayers of a Phonographic Doll" (Anderson Blanton)

VOICES AS PHONOGRAPHIC EVENT
Phonographic recursion of the phonetic alphabet
Historical *versus* media-archaeological reconstruction of sonospheres
Indirect transmission of sound (the vocal alphabet)
Sound archaeology
Technologies of sonic tradition: a signal-to-noise ratio
"First Sounds" (Patrick Feaster): (Archaeo-)Phonography *avant la lettre*
Active media archaeology: Sonic revelations from the past (*Au claire du lune*)
Sonic arts / acoustic archaeology

SPEECH SYNTHESIS / VOCODER
The Vocoder
[Un-natural: Artificial voices]
"Frozen" voices
"Harmonizing" voices by sampling
"Cold" speech synthesis

PHONETIC "SOUND" AND THE UN-ARCHIVABLE
A different kind of recording: The phonographic un-archive
Remembering past sonospheres by technical media
Is there a "sound of the archive"? Listening to silence with media-archaeological ears
Material entropy of the signal *versus* symbolic (archival) endurance of sound recording

PHONETIC ANALYTICS

Case study: "Lautarchiv", Humboldt University

- phonetician Otto Bremer, founder of the *Schallarchiv* at the University of Halle in Germany (1910), rescued a dying German dialect (the "Wangeroogische" on North See island) in 1924 by direct phonographic interview = http://edoc.bibliothek.uni-halle.de

- application of dynamic time warping (DTW) in automatic speech recognition, to cope with different speaking speeds; to warp: verdrehen, verzerren, entstellen; time warp = Zeitschleife; L. R. Rabiner / B. Juang. Fundamentals of

speech recognition, Prentice-Hall, Inc., 1993 (chapt. 4)

- cultural *analysis* historically contextualizes the Lautarchiv recordings and concentrates on their ambiguous cultural meaning; this approach matched by cultural *analytics* which is expressed by spectographs for audio content - a dramatic hift of emphasis from the symbolical textual field to the processing of the real audio signals. All of the sudden, voices may be identified by their very spectral individuality, not exclusively subjected to alphabetic registration in written metadata any more. Next to the well-known symbolic order of the archive (which goes with the symbolic order of administration, bureaucracy and the state governmentality) a signal memory arises: the phonographic record

- media-historiographically canonized „first“ technical, not just symbolical recording of a human voice (the children song „Mary had a little lamb“) resulted from the experiment of Thomas Alva Edison with the tinfoil phonograph in 1877; this primary scence *re-enacted* by the elderly inventor (Edison) himself. While the recorded signal principally stays invariant over time, the body from which the song originated apparently has aged, being strictly subjected to what we call historical time; Beckett's drama *Krapp's Last Tape* (1958)

- media-historiographically canonized "first" technical, not just symbolical recording of a human voice (the children song "Mary had a little lamb") resulted from the experiment of Thomas Alva Edison with the tinfoil phonograph in 1877; this primary scence has been re-enacted by the elderly inventor (Edison) himself, re-enacted 3o years later by his same / different voice for a sound film: *Mary had a little lamb*. While the recorded signal principally stays invariant over time, the body from which the song originated apparently has aged, thus being subject to historical time.

- To convince the audience of the sonic fidelity of phonographic recording, the Edison Company in 1916 arranged for an experimental setting in the New York Carnegie Hall: "Alone on the vast stage there stood a mahagony phonograph <...>. In the midst of the hushed silence a white-gloved man emerged from the mysterious region behind the draperies, solemnly placed a record in the gaping mouth of the machine, wound it up and vanished. Then Mme. Rappold stepped forward, and leaning one arm affectionately on the phonograph began to sing an air from "Tosca." The phonograph also began to sing "Vissi d' Arte, Vissi d'Amore" at the top of its mechanical lungs, with exactly the same accent and intonation, even stopping to take a breath in unison with the prima donna. Occasionally the singer would stop and the phonograph carried on the air alone. When the mechanical voice ended Mme. Rappold sang. The fascination for the audience lay in guessing whether Mme. Rappold or the phonograph was at work, or whether they were singing together."[1]

- similar staging of human vocal performance *versus* apparative acoustic operativity has been commented by the *Boston Journal* in the same year: "It was actually impossible to distinguish the singer's living voice from its re-creation in the instrument" = = quoted here after: Emely A. Thompson, Machines, Music, and the Quest for Fidelity. Marketing the Edison Phonograph in

1 "Edison Snares Soul of Music", in: New York Tribune, 29. April 1916, 3

America 1877-1925, in: The Musical Quartely Bd. 79 (1995), 132. Dazu Peter Wicke, Das Sonische in der Musik, in: Das Sonische. Sounds zwischen Akustik und Ästhetik, in: PopScriptum 10 (2008), *online* http://www2.hu-berlin.de/fpm/popscrip/themen/pst10/index.htm. What took place is the chrono-Sirenism of *His master´s voice*, which is the presence-generating "illusion of being present" (Peter Wicke), induced by technical recording.

- immediately after its invention, the Edison phonograph was announced in the journal *Scientific American*. It obviously triggered phono-archival phantasms in the Romantic tradition of the historian of the French Revolution Jules Michelet, who in early Nineteenth century believed to hear the murmurs of the dead in the archives. A true *Lautarchiv* is being declared: "That the voices of those who departed before the invention of the wonderful apparatus [...] are for ever stilled is too obvious a truth; but whoever has spoken or whoever may speak into the mouthpiece of the phonograph, and whose words are recorded by it, has the assurance that his speech may be reproduced audibly in his own tones long after he himself has turned to dust. [...] A strip of indented paper travels through a little machine, the sounds of the latter are magnified, and our great grandchildren or posterity centuries hence hear us as plainly as if we were present."[2]

- Berlin *Lautarchiv*, as its very name expresses, not just an audio archive of human voices and ethnic songs from the past, but as well an archive of *Laute*, which in German refers to phonetic and sonic, even noisy articulation - that is, all kind of acoustic enunciations. Listening to the records with media-archaeological ears, one detects not only the human speech but the expression of the recording apparatus und storage media themselves - the scratches and the revolving rhythms of the Edison cylinders. In the online-inventory of the *Lautarchiv*, among page-long enumeration of recorded ethnic songs, two artefactual devices are listed which embody the media-archivological condition for listening to such voices from the World War One past at all: items no. (ID) 9311 (type "Plastisches Objekt") *Zwei Tonabnehmer* (electro-magnetic pick-ups)

- on the linguistic field that the first computational algorithms for voice recognition have been developed - as "Umwaldung der physikalisch meßbaren Schwingungsverläufe von Sprachsignalen in elektrische Impulssignale"[3]

- key operation of time-signal-to-frequency transformation: "Schwingungen können durch Folgen von Zahlen repräsentiert werden."[4] Thus, sonicity can not be reduced to the dynamics of waveforms, but encompasses mathematical operations (and their computing machinic embodiments) as well.

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2 Anon. (The Editor), A Wonderful Invention - Speech Capable of Indefinite Repetition from Automatic Records, in: Scientific American, 17. November 1877, 304; see chap. 6 "A Resonant Tomb", in: Jonathan Sterne, The Audible Past. Cultural Origins of Sound Reproduction, Durham / London (Duke University Press) 2003, 287-334 (297f)

3 See H. Schnelle, Automatische Sprachlauterkennung, in: Kybernetische Maschinen. Prinzip und Anwendugn der automatischen Nachrichtenverarbeitung, Frankfurt/M. (S. Fischer) 1964, 208-219 (208)

4 Schnelle 1964: 211

"Lautsprachliche Merkmale" (Schnelle) can be differntiated into *vokalisch*, *stimmhaft*, *sonant*, *(ex-)plosiv*, *geräuschhaft*[5].

- "statistic tools from corpus-based linguistics have been adopted for music analysis in recent years. "While the basic elements and features <...> over which statistics are computed naturally differ between linguistics and musicology, the statistical concepts that allow us to infer regularities within the specific domain are quite similar or nearly identical. Among the chief statistical concepts that can be derived from frequency counts of <...> features <...> in both fields, are Markov models, entropy and mutual information, association measures, unsupervised clustering techniques, and supervised classifiers such as decision trees" = Müllensiefen et al.: 140

- target of sonic analytics is not speech as semantic content in the hermeneutic sense, but first of all the very materiality of such bio-cultural articulation: the phonetic "Laut" (*phoné*). Thus the very name *Lautarchiv* can be deciphered literally, and different from other sound archives this one is especially apt for sonic analytics on the ground of its very "phonetic" target which was inscribed by its original promotor Doegen from the beginning - notwithstanding the circumstances of its coming-into-being in a prisoner camp (Wünsdorf close to Berlin) during World War I. While *Kulturwissenschaft* (cultural analysis) concentrates on this ambivalent historical and discursive context, the media archaeological ear rather listens to the actual media articulation contained in the Lautarchiv itself

- these recordings became integrated as *Lautabteilung* into the Prussian State Library in Berlin after World War I to be reproduced on schellack discs *and* as transcription for educational distribution[6]; the relation between spoken orality and its *grama*-phonic derivative (the phonetic alphabet as invented for the recording of the musicality of Homer's oral poetry) was reversed again by the intrusion of real audio speech signals into the previously merely symbolical order of the printed text in a library

"Tones can be made visible. The oscilloscope, through electrical processes, ftransforms vibrations of the air into a picture that appears on an illuinated screen. It is the picture of a wave line. <...> An experienced observer can accurately read the aocustical qualities of the tone from the outline of the curce. <...> The one thing he could not in any way deduce from the picture is the dynamic state of the tone. <...> the dynamic, the musical difference, does not appear in the curve" = Victor Zuckerkandl, Sound and Symbol. Music and the External World, New York (Pantheon) 1956, 22; corresponds with the material, tonally *integrative* engraving of a musical event in the phonographic groove: "The chains of physical events that at every instant give rise to the auditory experience all go back to the same point of origin, the point of the phonograph needle. The motions of the point of the needle are translated, through a number of technical intermediate esteps, into vibrations of a

5 Schnelle 1964: 210. See esp. Fig. 1 "Schematische Darstellung der Signalverarbeitung zur Erkennung des Merkmalpaares stimmhaft/stimmlos", in: Schnelle 1964: 213

6 Edition *Lautbibliothek: Phonetische Platten und Umschriften*, ed. by the Lautabteilung der Preußischen Staatsbibliothek, 1920s

membrane and thus into air vibrations. Like every material point, the point of the needle can make only one movement at one time. <...> The illuminated disk of the oscilloscope shows only one line, no matter how many tones are sung into the microphone simultaneously <...>. <...> what the apparatus registers as *one* wave, we *hear* as *multiplicity* of tones - and as a organized multiuplicity <...>. <...> in our / hearing, this single visible line becomes a combination of lines exhibiting vertical and horizontal relations of the highest cpmplexity <...>. To be sure, mathematical analysis of the shape of the line permits us to deduce the individual waves that are combined in it. Yet <...> our ear accomplishes, effortlessly, continuously, and instantaneously, what costs the skilled mathemtician a considerable expenditure of time and energy" = Victor Zuckerkandl, Sound and Symbol. Music and the External World, New York (Pantheon) 1956, 333 f. - until Fast Fourier Transform arrived in digital real-time computing

- techno-metrical analysis of phontic recordings, limited by the signal bandwidth of mechanical sound records from the past (*terminus ante quem*) as compared to electro-magnetic (or sound film) recording

"Short dictaphone bio"

- for Harvard University (Musicology) Sawyer seminar on "Hearing Modernity" website, invitation to produce a short web bio as a sound file. "If you have a smartphone, this can most simply be recorded with the dictaphone function" = Alexander Rehding, e-mail 16 March 2013. Actual recording: "This is the voice of Wolfgang Ernst, recorded for the design of the website of the Sawyer seminar on "Hearing Modernity" at Harvard University. Is this is my voice? Does one recognize me when listening to this audio recording like the dog Nipper once's recognized "His Master's Voice" from gramophone? Being a true media archaeologist, I did not use the dictaphone function (as "app") of a smartphone (I do not even dispose of such a mobile communication device). To produce this sound sample I rather enacted a recording on a real dictaphone from the Media Archaeological Artefacts Collection at Humboldt University, Berlin. My voice audibly is subject to unintended and entropic accelerations or slowing down since this recording and re-play takes place on an antique analog electro-magnetophonic medium (even though, in order to become part of this Internet website, this recording had to be sampled and compressed into a digital data format which claims to be invariant towards temporal change). This dis-embodied voice tells as much about the technological biography of the dictaphone itself. 'This can be a simple narration about yourself'; thus I have been invited to contribute to this experimental form of acoustic media theatre. Simply narrated, my academic *curriculum vitae* starts with my passion for times past which once led me to study ancient history, Latin and Greek philology and even classical archaeology. All of the sudden, with my increased interest and awareness of the technical infrastructures of collective memory and historical knowledge I grew into an emerging science called Media Studies, thus turning from a trained historian to a media archaeologist. The recursive moment here is my re-iterated interest in temporal processes which finally lead me to investigate what I call sonicity (or somewhat artificially *das Sonische* in German, to differentiate it from simple sound as *Klang*). Sonic articulation, like techno-mathematical media, are in beeing only when unfolded in time. This

leads to the close affinity between sound and media dynamics. Will this audio recording, my "narration about myself", eventually be used to forensic speech recognition and sound recorder analysis at a later moment, to authorize the live recording of my forthcoming talk at Harvard?"

- media-archaeological reminder and re-call of Thomas Alva Edison: sound recording technologies not invented for narrative purpose, but for bureaucratic dictation - except "oral poetry", perhaps. The arbitrary implementation of symbolical vowels which once modified the Phenician alphabet into phonetic writing still used today happened for poetic reasons, to write down the musicality in the voice of Homer. So let me finally *include a sound* that I pay respect for, the epic song of the legendary Yugoslav *guslar* Avdo Medjedovic, from the Milman Parry Collection of Oral Literature at Harvard University.

Lautarchiv *analytics*

- "Schematische Darstellung der Signalverarbeitung zur Erkennung des Merkmalpaares stimmhaft/stimmlos", in: Schnelle 1964: 213, Fig. 1

- oscillograms by Brandl, from: Britta Lange, Playback. Wiederholung und Wiederholbarkeit in der frühen vergleichenden Musikwissenschaft, Preprint 321 of the Max-Planck-Institut für Wissenschaftsgeschichte Berlin (2006)

- sonic analytics (provided by Nikita Braguinski) for a recording of the folk Song *Vo kuznice*, 1916 with a chorus of Russian war prisoners; Lautarchiv inventory no. PK135-Mersbach; instead of traditional alphabetical transcription, open source linguistic software like Praat allows for (and incites) new kinds of "archive" mobilization: *signal-based* speech analysis. Under such observation, audio recordings are not just archival objects any more, but become items in an experimental laboratory of presence. This presence is a distorted one, though. Trendelenburg describes the distortions of sound fidelity which are essential features of phonographic and grammophonic records.[7] This is the bandwidth limit of mechanical sound records from the past as compared to electro-magnetic and finally digitally processed recording

- recordings of famous voices (which for political reasons were partly neutralized or even destroyed after 1945); truly phonetical recordings of local speech dialects, based on a set of artificial word sequences in order to achieve formal comparability (so-called Wenker-sentences) with the speed of the recording beeing controlled by a supplementary oscillographic time code, and early recordings for musical ethnology (mostly Africans and Indians from the French and British Army in the World War One *Halbmond* prisoner camp at Wünsdorf south of Berlin)[8]

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7 Ferdinand Trendelenburg, Klänge und Geräusche. Methoden und Ergebnisse der Klangforschung, Schallwahrnehmung, grundlegende Fragen der Klangübertragung, Berlin (Julius Springer) 1935, 51

8 See Britta Lange, Ein Archiv von Stimmen. Kriegsgefangene unter ethnografischer Beobachtung, in: Nikolaus Wegmann / Harun Maye / Cornelius Reiber (eds.), Original / Ton. Zur Mediengeschichte des O-Tons, Konstanz (Universitätsverlag) 2006, 317-341 (esp. 335f). An almost complete list of

- phonological target inscribed into the Lautarchiv by its promotor Wilhelm Doegen from the beginning - notwithstanding the circumstances of its coming-into-being with recordings in a prisoner camp. While cultural analysis concentrates on this ambivalent historical and discursive context, with a different epistemological vantage point media archaeology lends its ears to knowledge which can be derived from the actual media articulation contained in the technical archive itself.

- Lautarchiv currently in a dormant state, a "frozen" archive, "cold" storage of recorded voices. To wake it up does not necessarily mean to transform it into a public museum; activating the store (respectively the data bank) today rather means transforming it into an informatinal space <see Kittler 2007: 112>

- not turning the Lautarchiv into cultural museum, but informations system (Thomas Nückel

- to become such an informational system, the digital sampling of its analog contents (both in terms of hardware and of signal recording) is necessary

- digital "archive" absorbs all previous media - not materially, but as formats = Kittler 2007: 113

- limits of digital archive-"tectonics": even lossless compression results in bandwidth limitations in recorded frequency spectrum

- digitized sound file is subject to new kind of invisible, sublime protocols - the new *archive* in Foucault's sense; loss of material original sound carrier, though, would make research with future, yet unknown analytic technoliogies irreversively impossible

Case Study in sonic analytics: Kurenniemi's audio-diary, re-activated by Constant

- listening to recorded sound through the ears of the algorithms; multiple correlations vs. fixed taxonomy; thus: not single sound files are being reveiled, but relations within sound bits within, a *diagrammatic* sonic archive

- Kurenniemi's cassette tapes (Philipps-Recorder); analysis of digitized audio-Inhalte with Spectrum sort-Algorithmus (loudness / dynamics in decibel), thereby extracting song-like passages; apply to *Lautarchiv*; separate speaker from (noisy) background; Constant file associative_memory.aif; Herfried Weiser, quasi-phonetic commanding of video cuts by Kittler's articulation

- *sonicity* refers to search algorithms as well: sonic analytics; algorithmic ("automated") tagging (mark-up), a kind of metadata from within the medium; oppose / combine with "social tagging" which is non-classified in similar ways:

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the both phonographically and symbolically registered recordings is provided online: http://www.sammlungen.hu-berlin.de/sammlungen/78.

hybridisation

- algorithmically / automatically tagging "silence" (intentinonal and non-intantional one); "analysis"-tool under AUDACITY: "Silence Finder"; under "Effects" option: "Stille entfernen"; further: "Echo"; "Beat Finder"; frequency analysis (choice of sampling rates)

- algorithmic annotation with software from computational linguistics: temporalizing phonems, software PRAAT (Netherlands), PLP Laboratory; University of Mons: voice synthesizer; experimentation with the *a priori* of data organization

Kurenniemi's development of DIMI-A = Digital Music Instrument, Associative Memory, 1969, with its characteristic mode of choosing audio data according to content in the memory, not with addresses / hashing

- Fast Fourier Transformation, by which any kind of (digitized) sound is being broken down into discrete time slices / shunks of sound

- According to Fourier, any sound can be decomposed into its single sine waves which - in reverse - can be expressed (and thus: computatinally addressed) as frequency, i. e.: numbers; sound as addition of tones = drone ("Ge/Summe"), both kymatically and mathematically

- Erkki Kurennimi - A Man from the Future, edited by Maritta Mellais, Helsinki (Finnish National Gallery) 2013; *online* http://www.lahteilla.fi/kurenniemi/fi/a-man-from-the-future

- http://activearchives.org/wiki/Archive_in_motion_presentation#Audiogrep

- life-logging; cp. Gordon Bell (at Microsoft), project Life Caching

- Kurenniemi's assemblage of different live-recording media (now deposited at the Central Art Archives of the National Gallery in Helsinki). Keeping this legacy "open" requires stopping making pre-figurated sense by classification, in favour of stochastic, Markov-chain based retrieval

- Constant Association for Art and Media based in Brussels; Active Archives project in 2006: "*How can archives be active beyond preservation and access?* What would it take to give material away and receive it transformed? [...] Constant members Michael Murtaugh and Nicolas Malevé have been running a series of experiments with a subset of the Kurenniemi’s archive."

- project *Online Archive: Erkki Kurenniemi (In 2048)* commissioned by Kurator and *Documenta* 13 in partnership with the Central Art Archive of the Finnish National Gallery and Contemporary Art Museum KIASMA in Helsinki

- website of Constant's Kurenniemi project, the "logbook" (includes Constant’s probes into the archive, sample visual data and allows for interaction with the *data radio*

- multiple correlations turn out *versus* fixed taxonomy; thus: not single sound

files are being reveiled, but relations within sound bits within, a *diagrammatic* sonic archive

- algorithmic analysis is driven by source code implemented into operative computers. Constant defines the "active archive" as "[...] strategies and tools that amplify and diversify the *process* of archival work, to actually reveals its technological conditions: "a software-machine, as readable, writeable and exectutable", in an effort to let the material "'speak' for - itself"[9] - which is the Rankean fiction (itself a media effect of early phonotgraphy as indexical "selbst-registration" of nature, or the kymograph als self-registering sonic signals, to archive-based writing of history); beyond traditional historicism: nagivating audio-visual data (once sampled into bits and bytes) from *within*, that is: truly media-archaeologically, suspended from metadata

- while traditional archival format for records (spatial order, classification) will in many ways necessarily persist, the algorithmization of its digitized records is radically temporalized, ephemeral, multisensual, corresponding with a dynamic user culture which is less concerned with records for eternity but with order by fluctuation

- to derive new insights from the Finnish artist-engineer Erkki Kurenniemi's audio-cassette-diaries from the 1970s by means of the "active archive", Constant has developed a "Spectrum Sort" tool.[10] An audio file is beeing digitized in samples of a a tenth second, resulting in a set of dynamic levels. With their strongest values being extracted, a new audio file is being created which is sorted from the lowest to the hightest frequency bands. Thereby the moments when Kurennemi does not dictate speech any more but occasinally starts singing can be identified immediately from the mass of his cassette tapes

Listening to magnetic tape recordings

- acoustic evidence: "And if there are gaps within the signal, we can usually organize the incoming signals into a meaningful pattern, or a complete *gestalt*, by filling in those gaps“[11]; Joseph Jastrow's experiments with visual ambiguity around 1900 (figure-grund-ambivalence as perceptional relais)

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9 Geoff Cox / Nicolas Malevè and Michael Murtaugh, Archiving the Data-body: human and nonhuman agency in the documents of Kurenniemi, to be published in: <Kurenniemi>, MIT Press 2015; online: body_human_and_nonhuman_agency_in_the_documents_of_Kurenniemi (accessed July 15, 2014)

10 See Jussi Parikka, DIY futurology. Kurenniemi's Signal Based Cosmology, in: Erkki Kurenniemi - A Man From the Future, ed. by Maritta Mellais (Helsinki Finnish National Gallery) 2013, 32-55; http://www.lahteilla.fi/kurenniemi./en/content/erkki-kurenniemi-%E2%80%93-man-future (accessed July 16, 2014)

11 Helmut Esau, The „smoking gun“ tape: Analysis of the information structure in the Nixon tapes, in: Text. An interdisciplinary journal for the study of discourse, vol. 2 (4), New York / Amsterdam (Mouton) 1982, 293-322 (306)

- listening to the magnetic tapes recording Nixon´s wordls in the Watergate skandal,

- Oliver Stone's film *Nixon - Der Untergang eines Präsidenten* (USA 1995); magnetic tape recording of Nixon´s words in the Watergate skandal: "Nothing here now but the recordings" (William Burroughs). "Although my assistant and I listened to the line repeatedly with great care, we were able to hear neither *on with* nor *off*, but only unintelligible noise. Thus depending on who listens to the line, the resulting *gestalt* is very different" = Esau 1982: 309

- Human eyes and ears tend to overlook and overhear noise as information = Harris 2001: 122, otherwise compressing algorithms for streaming data in computing not acceptable; human hermeneutic preference for *Gestalt*, the filtering out of noise; non-human senses more sensitive to noise but unable to separate from meaningful signal; communication happens not only between humans any more, but in an emerging intra-technological intelligence

- "Nothing here now but the recordings" (William Burroughs); same author: *The Electronic Revolution* (Expanded Media Edition, 1970). "Although my assistant and I listened to the line repeatedly with great care, we were able to hear neither *on with* nor *off*, but only unintelligible noise. Thus depending on who listens to the line, the resulting *gestalt* is very different" = Esau 1982: 309

Frequency analysis: Popular music as technical memory

- turn a passive archive (or collection) composed of silent sound carriers ("Tonkonserven") into an active archive. by applying measuring and algorithmic analysis media themselves become "archaeologists" of sounds past

- take the visible image of grooves in a vinyl record literally and analyze them as what they apparently are: wave forms

GUSLARI *ON-LINE*. A technological interpretation of oral poetry

Electrified memory

- non-philological analysis of "oral poetry", when its notation for analysis does not take place in symbolical writing (the phonetic alphabet since the age of archaic Greece, or more recently, musical notation) any more, but by (electro-)physical recording media like the phonograph, as performed by Milman Parry on aluminium discs; micro-events in performing oral poetry thus get under consideration, near-discontinuous change, probabilities of transitions, re- and protentions which require stochastic rather than simply statistical analysis. The "realtime" feedback on the sensomotoric level which takes place between the human articulation and the rhythmic *gusle* play turns out to be of a servo-mechanical rather than musical character; Godoy

- paradox of "preserving the ephemeral" of oral poetry by transcription of phonographic recording (Parry / Lord, Bowles et al.); documentation by

arbitrary, coded, disctrete signs is symbolic, remains outside ephemeral cultural articulations; signal recording captures it, while at the same time freezing it; no active tradition but memory in latency

- as long as scripture-based archives only, the phantasma of recording the acoustically real, i. e. the non-recordable (which has been, until the occurence of the phonograph, the human voice and musical expression) generated rhetorical, symbolic and scriptual forms of memorizing sound in imaginary ways. With the emergence of the phonograph, new type of signal recording has still been subjected to forms of inventorization and administration which were developed in the long-time context of paper-based archives

- pre-phonographic metaphors of writing in medieval times: Horst Wenzel, Die "fließende" Rede und der „gefrorene“ Text. Metaphern der Medialität, in: Gerhard Neumann (ed.), Poststruktuarlismus: Herausforderung an die Literaturwissenschaft, xxx

- ethnomusical recordings taken by the ethnologist Selenka who went to India in 1907; by over-sampled digitizing of the original wax cylinder, possible today to listen to this play-back in exactly the same quality as the Indian natives could in 1907[12]

- "cultural" memory (notably oral poetry) of a different nature if it is not mechanically recorded by phonograph or gramophone which is still close to graphical "writing", but electronically on magnetic wire or tape, as performed by Albert Lord on the same ground around 1950

- irritation of the temporality of cultural memory with phonograpic recording of the real voice. Next to traditional notions of archival historicity, with recordability of oral poetry as a physical audio-event (not just symbolically like on the phonetic alphabet) kind of re-presentation of past performances takes place which remains largely invariant towards chance in historical time. Media-inherent temporality differs from the established notions of cultural history

- is the digital processing of analogue recordings just another technical extension or does it transform the very essence of oral literature? In a crude way, algorithmic processing of poetic rhythms, as genuinely re-generative, might be closer to the "formulaic" principle detected by Parry than any other kind of technical reproduction was before

- two chrono-technical cycles: tradition of songs and tales, for millenia, happened in mnemotechnics of oral transmission, increasingly accompanied (supplemented, deferred) by notational writing (the vocal alphabet, musical notes). The 20th century enabled a media-induced re-entry of orality, a secundary orality (Walter Ong) based on analog recording technologies like phonography, magnetic tape and kinematography. In the 21st century, the symbolic notation has re-entered as well: in the form of the alphanumeric code within computing

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12 See http://www.gfai.de/deutsch/projekte/bildverarbeitung-industrielle-anwendungen-projekte/spubito.html (accessed November 4th, 2013)

- from Cultural Analysis (name of Institute at Amsterdam University) to "Cultural Analytics" (in terms of Lev Manovich)

Transcription *versus* technical recording

- in the mid-1930s Harvard scholar Milman Parry investigated the South Yugoslavian unwritten memorizing techniques of epic singers (the *guslari*) as a living analogy to Homer's ancient songs; direct phonographic sound recordings on aluminium discs provided the analytic basis for the resulting theory that hour-long oral tales were regenerated for each occasion from a stock of existing formulae (the formulaic theory of oral poetry); take this formulaic theory technologically: "Even Homer's rose-fingered Eos was thus a goddess transformed into a piece of chromium dioxide that was stored in the memory of the rhapsodes and could be combined with other material to create entire epics" = Kittler 1986: xxx

- cultural feed-back: What happens when such a recording is being re-played these days to the local culture in Serbia from the sound recordings using the same device? Media archaeologist in Lord's position when recording a *guslar* performance with a historic Webster Wire Recorder today?

- Webster wire recorder (Webster Chicago Corporation), 1948; wire coils, tube amplifier, built-in loudspeaker; electronic (vacuum tube-based) storage medium for conserving sound, based on the transverse-magnetization of a steel wire drawn across a recording head; the device developed by Valedmar Poulsen around 1900 was originally intended for office dictation or telephone answering machine; records with 2.200 meters of wire and a speed of around 60 cm/sec., thus capable of storing up to one hour of sound. Model 80 manufactured by WEBSTER CHICAGO, in 1945, and was nicknamed an "Electronic Memory"

In 1950/51, Parry's assitant Albert Lord returned to the scene to repeat or continue some of the first recordings, sometimes with the same singers. But this time he used a new technology, a magnetic recording device (based on steel wire). Which difference does it make if popular song recording does not take place gramophonically on aluminium discs any more but electro-inductively *happens* on magnetic medium? Mechanical recording is a passive storage techology; magnetic recording, though, requires a electro-dynamic re-enactment to be reproduced

- mechanical sound recording directly corresponds with (and to) the mechanical vibrations of the Gusle string and the Guslari voice; magnetic recording requires the intervenence or a literally technical "medium" which is the apparatus of electro-magnetic induction. The wire recorder, by its very recording medium (a steel wire), directly corresponds with the telephone line - thus allowing for a kind of direct transmission of recorded songs from storage to presence ("re-storing presence")

- "Wirephones use the same principle as tape recorders, i.e. a magnetic recording of sound on a moving magnetic carrier. This carrier is in case of wirephone a thin steel wire of the diameter about 0.1 mm. The wire moves

with the speed 1 m/s" = National technical museum in Prague = http://www.ntm.cz/en/heslar/wirephones.html; Zugriff 7. Juni 2006

- *auloi* "tragen die Mathematik in sich"[13], since they require - different from flutes with discreetely punched air holes - continuous tuning

- around 1820, the *Darmsaite* in Manchester is replaced by metal strings (for piano first); Amerikan "Idee, diese Stahlsaiten wie elektrische Impulsegeber zu behandeln" = Kittler ibid.; such *inductive* vibrations can be transduced, and upon the basis of the thermionic tubes (later transistors) be amplified. Fed back into the guitar, non-linear distortions happen; Tomaszyk on *metal* string

- in media-archaeological sense, read title "the electrified Gusle" (rather a sociological reading) most literally: Tanja Zimmermann, The folk instrument *gusle* and its resistance to electrification; the metal string directly corresponds with the Wire Recorder

- wire recorder like the "Webster Chicago" used by Lord is not a phonograph, which, as the name suggests, is still part of the tradition of graphical recordings, but instead transforms the sound memory into a different physical state. The process of electromagnetic recording and reproduction is, however, not a continuation of writing in a new form, but rather a fundamentally different and genuine technical media event born of the very nature of electricity

Rescuing the ephemerality of sonic articulation from "historical" time: symbolic notation and signal recording

- musical notation „saves“ (or deprives) music from time: sonic articulation is ephemeral and time-based and self-annihilating by definition. Lionardo da Vinci's *Trattato di pittura*: Whereas painting and sculpture are „permanente“, music „sie va consumando mentre ch'ella nasce“ = quoted after: Hammerstein 1966: 1; quote Hegel: tone / transition, in: ZEITWEISAKUST; Isidor from Sevilla (died 630): „Nisi enim ab homine memoria teneantur soni, pereant, quia scribi non possunt“ <zitiert auch von Hammerstein 1966: 4> - until the arrival of Guido of Arezzos notation of musical duration (symbolically) and the phonograph (signal-really) allowed for fixing sonic articulation

- what articulates „it“self in listening to Edison cylinders is noise such as can be expected in any transmission channel according to the theory of communication developed by Claude Shannons - a theorem which can be extended to transmission in time as well, that is: tradition. In such noise articulates itself what baroque allegories showed as the nagging „tooth of time“ - the articulation of physical entropy, the manifestation of the temporal arrow; according to the Second Law of Thermodynamics each system tends, over time, to increasing dis-order

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13 Dionysios <sic> Revisited. Vom patriarchalischen Ideenhimmel und dem Reich der irdischen Liebe, Gespräche von Frank M. Raddatz mit Friedrich Kittler, erschienen in: Lettre international, 89. Heft, 2010. Hier zitiert nach dem Wiederabdruck in: Friedrich Kittler, Das Nahen der Götter vorbereiten, München (Fink) 2012, 62-86 (80)

- traditional archival endurance of records, being based on the very materiality of its carriers (storage media), changes its nature from endurance to the „enduring ephemeral“ (Wendy Chun) when record not fixed any more on a permanent storage medium but takes places electronically; flow (the dynamic essense of electric current) replaces inscription (storage)

The Wire Recorder (technical description)

- Webster Chicago Corporation, 1948: wire coils, tube amplifier, built-in loudspeaker; electronic (vacuum tube-based) storage medium for conserving sound, based on the transverse-magnetization of a steel wire drawn across a recording head; the device developed by Valedmar Poulsen around 1900 was originally intended for office dictation or telephone answering machine. Webster wire recorder records with 2.200 meters of wire and a speed of around 60 cm/sec., thus capable of storing up to one hour of sound; entry "Webster Wire Recorder M80" in: Institut für Medienarchäologie (ed.), Zauberhafte Klangmaschinen. Von der Sprechmaschine bis zur Soundkarte, Mainz (Schott) 2008: 112

- media *un*dead: wire spool; to Garnet Hertz, Telharmonium Press, Hollywood, California: enclosed a long stripe of "recording wire" (as it was once called in the US by the Webster Wire Recorder Company, Chicago, for the Webster Wire Recorder of 1948), kind of mnemonic trace, electronic memory reduced to the thinnest possible form of electric writing (0,1mm). It does not come from a removable supply reel of Webster Chicago, but of a wire recorder produced by the German company "Lorenz Radio" (Schaub-Lorenz) from roughly the same years: from 1952, a device called *Supraphon 52*; see http://www.radiomuseum.org/r/schaub_supraphon_52.html; as well the paper description which accompanied the original reel box, explaining how to knit a piece of wire in case it disrupted (which often happened while re-playing it on the recorder); cut it e. g. in pieces to add it to the *Problems* like with the stripes of punched Morse code for the first edition. Which brings me to a second, more deeply media-archaeological point: Just like the piece of punched Morse code might be now re-inserted into a reading mechanism which can decipher the latent massage, the piece of wire most probably magnetically stores a voice or piece of music (well, sound waves) once uttered around 1950 and recorded on wire, so any reader of the second edition of the *Problems* might insert it into a working wire recorder (re-activated, maybe, from a technological museum) and perceive unexpected voices. So in a strict way, this is not about dead media, but on: media undead. There is an untimeliness of media which is incorporated here.

Technical recording vs. symbolic transcription (Bartok)

- musical transcription which Bela Bartok provided for Milman Parry's recordings of Guslari songs on aluminium disc. What the discs were able to record, though, was a surplus: the non-musical articulations, noise or bird-singing in the background, even Avdo Mededovic's coffing. Thus media-archaeology uncovers a *mémoire involontaire* of past acoustic, not intended for

tradition - a noisy memory, unaccessable for alphabetic or other symbolic recording.

- different from notational transcription into musical scores, technical signal-recording of cultural articulation allows for the electro-physical measuring of recorded events (digitally done by "sampling"). This exposes the cultural event to analytic, even mathematical experimentation, thus enabling a non-hemeneutic analysis of cultural articulation on the sub-philological, even sub-alphabetic level

- not just oral poetry recorded but as well noise, while the transcriptions into musical notation treat the sonic event as "oral literature" (as the Harvard Milman Parry Collection of Oral Literature actually calls itself), thus keeping the analysis within the disciplinary discourse of the researchers (Parry, a trained philologist)

- not just oral poetry was recorded but as well noise, while the transcriptions into musical notation treat the sonic event as "oral literature" (as the Harvard Collection actually calls itself), thus keeping the analysis within the disciplinary discourse of the researchers (Milman Parry, trained philologist)

- *guslar* Avdo Mededovic, Parry / Lord recorded 45000 poetic lines on phonographic discs, and 33500 lines in manual transcription = Gertrud Leuze, Homer und "Oral Poetry". Milman Parrys These und meine Erfahrungen im ehemaligen Jugoslawien, in: Würzburger Jahrbücher für die Altertumswissenschaft. Neue Folge, Bd. 26 (2002), 5-12 (Anm. 8)

- with so-called digital culture, the alphabetic communication returns again - no "recursion" (supposed within the same cultural algorithms) but as re-occurrence, rather re-invention, re-generation, from within the alphanumeric code, invisible to most human users of such technologies

- 1950/51, Albert Lord returns to the scene to repeat or continue some of Parry's first recordings, even with the same singers; this time use of a new technology, a magnetic recording device (based on steel wire). Which difference does it make if popular song recording does not take place gramophonically on aluminium discs any more but electro-inductively *happens* on magnetic medium? Mechanical recording is a passive storage technology; electromagnetic recording, though, requires a dynamic re-enactment to be reproduced

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- while Lord re-enacts some of Parry's first aluminium disc recordings with the same singers, in the meantime, technology has advanced. His wire recorder registered sound in non-mechanical ways, in the dynamics of the electromagnetic field. Electromagnetic recording and reproduction is not a

continuation of writing in a new form, but a different existence of "memory". When a singer is replayed in electronic form in "high fidelity", the technology itself seems to efface itself in a way which apparently lets the originality and individuality of the singer shine through the apparatus, as dead as he might biologically be. The cultural, human aspect is being expressed in the most un-human medium; the circle of vibrations and frequencies in technology and poetry is complete; coldest media archaeological device is the best way to memorize unique moments of human culture, such as oral poetry

Discovering sub-semantic poetic articulation: Interpretation by measuring

- by (electro-)physical recording media like the phonograph, as performed by Milman Parry on aluminium discs. Micro-events in performing oral poetry might thus get under consideration, near-discontinuous change, probabilities of transitions, re- and protentions which require stochastic rather than simply statistical analysis (known from Claude Shannon's mathematical analysis of communication and more specifically from his analysis of dynamic toys, described as "Mathematical Theory of Little Juggling Clowns"[14]). The "realtime" feedback on the sensomotoric level which takes place between the human articulation and the rhythmic *gusle* play. e. g., turns out to be of a servo-mechanical rather than musical character

- formulaic theory (Parry) involves a similar topic like the analysis of (anti-)aircraft ballistics in Second World War: the time of decision

- Norbert Wiener interested in responses of a linear resonator to random impulses: "This is physically realized by the well-known 'shot-effect' in vacuum tube circuits. In such a circuit, the current is carried across the vacuum by individual electrons, and, since these are indivisible, is subject to fluctations which are independent for non-overlapping intervals of time, and have a constant mean square average" = Norbert Wiener 1941 "On Linear Prediction", 1 (NA-227-D7-GP, Box 4, Folder: Project 6), quoted after: Roch 2009: 57

- "Ein Signal, Bomber oder Elektron, lässt sich dann als Impuls von fluktuierenden Schwankungen trennen" = Roch 2009: 58

- "transition time from straight to curved flight" according ao account from Bell Labs 1943 = ca. 3 secs[15] - the human "time-window" of the present. Anti-aircraft artillery: "There is a silent music to it."[16] The pre-calculated list / statistics becomes part of the actual present itself, register, *online* as condition of data processing in real-time <Roch 2009: 162>: Shannon: "artificial languages <...> we merely define abstractly [as] a stochastic process which

14 See Axel Roch, Claude E. Shannon: Spielzeug, Leben und die geheime Geschichte seiner Theorie der Information, Berlin (gegenstalt Verlag) 2009, 163f

15 NA-227-D7-GP. Box 12, Folder Project 11, "Diary of DJS Conference at NACA v. 9. März 1943, hier zitiert nach: Roch 2009: 74

16 Robert Silverberg, zitiert von Claude Shannon; hier zitiert nach: Roch 2009: 188

generates a sequence of symbols"[17]

["Statistik beschreibt Häufigkeiten und Verteilungen im Raum, Stochastik beschreibt Ereignisse als Sequenzen in der Zeit, quantifiziert also die Wahrscheinlichkeiten, mit der Symbole als Sequenzen in der Zeit aufeinander folgen. Nicht mehr nur Frequenz, Häufigkeit oder Verteilung der Buchstaben, sodnern die mathematische Beschreibung der Übergänge, die Bindungen der Buchstaben bzw. Elemente technischer Sprachen als Folgen aufeinander." = Roch 2009: 112]

Novi Pazar trip report

- apply electro-magnetic and digital filter operations, Fourier-analysis, oscillo- and sonography to this recorded songs, since they have been translated in the electro-magnetic field which is waves (like sound) instead of elementary discrete symbols (the alphabet), giving access to a micro-world of technologies of culture

- "real-time poetry" (micro-temporal poetry in the field between neurobiology, philology, cultural performance and media recording)

- Parry's apparatus disappeared long ago; designed by Lincoln Thompson, a graduate of the Worcester Polytechnic Institute and founder of the Sound Specialties Company in Waterbury, Connecticut

- Milman Parry Collection at Harvard not digitizing the original spools, but tape copies that were made in the '70s

- strange cultural-technological correspondence between audio-frequencies produced by the Guslari voices and Gusle strings on the one hand, and the electro-magnetic field which is induced to oscillate in the same frequencies, but finally being able to turn it into numbers (thus computing) instead of letters (both Parry and Lord neglected from a philological perspective the neuro-physiological role the accompanying use of the Gusle plays for the realtime performance of the singers - with the Gusle sound not being intended to be a musical performance of its own quality, but a sono-metrical assitance to the embodiment of the formulae)

- singers had difficulty performing their songs without the aid of the gusle. In fact, after the assassination of King Alexander in 1934, there was a ban on singing, and Parry found that he would often have to give the guslar a gusle to finger (silently) while reciting; otherwise the guslar might be unable to give a correct text

- Lord´s re-recording on Wire Recorder which is electro-magnetic in its full sense, not more "engraving" the voice like the grammophone but distributing sound spectra in a Faradayan "field" - a stochastic approach no more in the sense of "stoicheia" but in the sense of probabilitic mathematics (Maxwell), closer to radio (Hertz) than to writing

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

- subject the recording to Fourier analysis of acoustic spectra performed by higly sensitive oscillographic and digital measing devices; switch to another mode of observation which is not fixed at the human performer any more

Computerprints for Albert Lord, MPC 1982

["File printouts from May (?) Hyde for Albert Lord, dated 02/06/82" in Milman Parry Collection, Widener Library; archival examination by Peter McMurray]

- technical hardware employed by Milman Parry (phonographic recording on aluminium discs) and Albert Lord (wire recorder spools) is significant for the "analog" age, while the application of software (algorithms) for the analysis of prosodic patterns in oral poetry looks like an early example of "digital humanities" research *avant la lettre* (in every sense)

- Georg Danek at Vienna University; experiments in computer analysis of oral poetry (similar approach with Homeric texts)

- Assembly? re-enginneering

- transcription of additional notes from the computer programmer to Albert Lord; very first line: "At long last you get some output!," written on a printout deemed a "jobfail"

- Lord/Hyde computer printout in the MPC box; check if we can identify the program code and re-engineer the automated search, against the handwritten remarks (kind of computer philology); the "rhythmic" pattern woven by the printout with the spacing

***Homeric Singing - An Approach to the Original Performance* (Danek)**

- a technique of singing the Homeric epics, appropriate for the primarily oral tradition from which these poems emerge. "The Homeric bard sang his songs to the four-stringed phorminx, improvising his four-note melody at the same time as he improvised his text, which was unique in every performance. His monotonous melody, far from interpreting the text, served only as a medium to transport the words and to catch the listeners' attention by their intrinsic rhythm" = http://www.oeaw.ac.at/kal/sh/index.htm; accessed 20-12-06; apply to servo-motoric feedback function of *gusle* instrument; Georg Danek, Bosnische Heldenepen, Klagenfurt / Celovec (Wieser) 2002, including translation of Avdo Medjedovic, Die Hochzeit des Vlahinjiç Alija, 37 ff. (Einleitung); 43-230

- theory "not to be understood as the exact reconstruction of a given melody, but as an approach to the technique the Homeric singers used to accommodate melodic principles to the demands of the individual verse, guided by the accentual structure and sentence-intonation of the Ancient Greek language as well as by metrical structures" = http://www.oeaw.ac.at/kal/sh/index.htm

- sample: Demodokos' song about Ares and Aphrodite: Od. 8, 267-366 = http://www.real.com/products/playerReal Player. MP3 File (Just the beginning of the song: Od. 8, 267-299, 2.4 MB). WAV-File (Just the very first lines: Od. 8, 267-273, 811KB)

- M. L. West, The singing of Homer and the modes of early Greek music, Journal of Hellenic Studies 101 (1981), 113-129. [General considerations; the tuning of the phorminx (but see: Ancient Greek Music, Oxford 1992, 328)]

- G. Danek, "Singing Homer". Überlegungen zu Sprechintonation und Epengesang, Wiener Humanistische Blätter 31 (1989), 1-15

- S. Hagel, Zu den Konstituenten des griechischen Hexameters, Wiener Studien 107/108 (1994), 77-108. [Statistics, general melodic contours]

- G. Danek / S. Hagel, Das Geheimnis der Lieder Homers - mit dem Computer entschlüsselt, Kremser Humanistische Blätter 3 1999, 47-55

- epic performance originally *sung*; Greek *aoidoi* "in unison with the accompaniment of the four-stringed *phorminx*, which implicates the use of only four notes for the melody"

- performance of Ancient Greek verse, "as heard today, which involves the so called *ictus* which overrides the word accents, has nothing in common with the ancient pronunciation"; ancient Greek poetry expressed by means of pitch, not of stress; early Greek hexameter poetry likely to have been sung to a fixed set of four notes, the melody governed by word accent and sentence intonation. "These results lead to a technique of Homeric song, which can be learned. The performer has to accommodate the accentual rises and falls of the individual words of the individual verse to the melodic contour which results from syntactical and metrical features. With some training anyone who is able to read Homer can achieve to improvise the melody to any given Homeric text easily" = Stefan Hagel 24 October 2002, http://member.linkexchange.com/cgi-bin/fc/fastcounter-login?787479

McLuhan on Parry / Lord

- McLuhan, in *The Gutenberg Galaxy*, "acknowledges Milman Parry and Albert Lord, who observed the cultural effects of technology on poetry – poetry within written and oral cultures, and the differences. McLuhan points to examples of cultural and sensory experiences within many cultures: Elizabethan, Russian, African and Greek. He insists that some senses are extended and privileged by technologies (speech, writing, print and finally television) at the detriment of other senses 6. He calls this an ‘outering’ or ‘uttering’ of sense, which creates ‘closed systems’: meaning that a simultaneous experience of senses is knocked off balance; McLuhan, Eric and Frank Zingrone. Essential McLuhan. (Toronto: House of Anasi Press), 1995, 101

NEURONAL *GUSLARI*

Technologies for uncovering the correlations between oral poetic articulation and senso-motoric instrument feedback

- one-string *gusle*, during the epic performances of oral poetry, applied by *guslari* (singers) not for musical instrumental company to the singing voice, but rather functions as a servo-motoric and acoustic feedback device which helps to time-critically decide which words to interpolate in a poetic line (i. e. the hexametric "time window" of poetical presence); extend software analysis to a transcription of the verbal song, so that the graphic analysis of the bow movements can be correlated with the micro-rhythm of poetic articulation, in order to detect the micro-temporal dynamics of oral memory techniques which take place without textual learning

- auditory and somatosensory information stored in short-term human brain memory; neural maps and processing modules, which process a syllable as a whole unit (specific processing time window around 100 msec and more); connect sensory state maps within the sensory-phonetic processing modules and the directly connected motor plan state map

- auditory (*gusle*) feedback as aid in order to decide metrically on micro-timing of speech as well as of singing. It is assumed that auditory feedback beside other feedback mechanisms (e.g. somatosensory feedback and visual feedback) helps to verify whether the current production of a passage of speech or singing is in accord with the acoustic-auditory intention.

acoustic-auditory speech signal can be interpreted as the result of movements (skilled actions) of speech articulators

- Rolf Inge Godøy, Marc Leman (eds.), Musical Gestures
Sound, Movement, and Meaning, New York / London 2010 (Routledge);
http://www.hf.uio.no/imv/english/people/aca/rolfig

- http://www.uio.no/english/research/groups/fourms = Music, Mind, Motion, Machines: research group working on issues in music cognition, sensor technologies and machine learning = the cybernetic premise; motiongrams and sonogram made from a video recording of oral poetry performance: AVDO.mov; line in the motiongram represents the changing light form an infrared motion capture camera that was also active during recording; parallel to typing articulated speech in its rhythmic pattern; cp. Nicolai Bernstein's chrono-cyclograms; see Julia Kursell, "Moscow eye"; Braguinski analysis of Berceby; motion caputure of musical gestures inculdes video-based computer vision techniques, infrared, electromagnetic, ultrasound, mechanical and inertial motiuon capture systems

- explicitely opposed to "notebook-orientated scholars"[18], Alan Lomax used mechanic and electronic recording devices of acoustic signals to catch folk

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18 Alan Lomax / Irmgard Bartenieff / Forrestine Paulay, Choreometrics. A Method for the Study of Cross-Cultural Pattern in Film, in: Ronald D. Cohen (ed.), Alan Lomax, Selected Writings 1934-1997, New York / London (Routledge) 2005, 275-284 (275)

songs more precisely than any symbolic score notation can do (which has been developed to suit "harmonic" occidental music); the kinesis approach: W. Condon "first makes a detailed phonetic record of the speaker in a scence. This micro-phonetic record becomes his base line. Condon then studies the speaker's bodily behavior phone by phone, frame by frame, using a stop motion projector." = Lomax et al,: Choremetrics: 27; Denis Gabor's creation of "acoustic quanta via film projector

- Condon "found that the body parts of every speaker move in rhythm to his own phonation and that all those within earshot synchronize their bodily movements in the most precise synchrony with those of the speaker" = 277

THE PHONOGRAPHIC APPARATUS

Phonography: Recording the volatile

- December 2007, to celebrate 120 year of Edison's "invention", *Phonographic Salon* i n and a s Media Theatre (Media Studies, Humboldt Univeresity); what literary historians all know, but never tested: Rilke's writing on the "Urgeräusch". Borrowing a skull from Humboldt University Hospital, application of a phonographic pick-up to listen to the zigzags of the "Kronen-Naht" (techno-like sound, indentions are rather a saw-tooth-signal); recording voices on blank Edison cylinders as well; finally test "Final Scratch" (Traktor) so reflect upon the re-entry of the vinyl groove into the digital disk-jockey world as an "analogue" regulating device

- as signal communicated via air pressure, sound is material, even violent; but as a temporal form it is volatile and perceived as "immaterial" phenomenon

Inbetween the present and the immediate past: acoustic delay

- “recording the sound of my speaking voice and I am going to play it back into the room again and again until the resonant frequencies of the room reinforce themselves so that any semblance of my speech with perhaps the exception of rhythm is destroyed. What you will hear, then, are the natural resonant frequencies of the room articulated by speech" = Alvin Lucier, I am Sitting in a Room, 1969

"This particular <...> piece is based on recording himself narrating a text, and then playing the recording back into the room, re-recording it. The new recording is then played back and re-recorded, and this process is repeated 32 times" - the heritage of the magnetic tape player (echo delay)

Phonograph *versus* magnetophone: Electronics makes a difference

- difference between analog and electro-magnetic audio recording not just a technical, but as well an epistemological one. While the phonograph belongs to what Jules-Étienne Marey once called the "graphical method" (analog

registering of signals by curves), the magnetophone has been based upon the electro-magnetic field which represents a completely different type; alphabetic writing substituted by electronic recording, nowadays re-turns with digital encoding in a different quality; sampling and quantizing of acoustic signals transforms time into frequencies (by analysis as a condition for re-synthesis, in fact: between Fourier analysis and Fourier synthesis). Digitalization means a radical transformation in the ontology of the sound record - from the physical signal to a matrix (chart, list) of its numerical values. Media culture turns from phonocentrism to mathematics

- phonographic record vs. magnetic record on tape; finally the digital recording represent fundamentally different materialities and logics (techo/logies) in terms of their ways of registering time-variant signals, time-based forms of reproduction and their "archival" being in time; electronic tube, especially the triode, once liberated technical media from mechanical constrains, thus: from erasure over time; still the tube or transistor are subject to decay over time themselves

- "Entropy is the measure of the second law of thermodynamics - which states that the energy disorder of any closed system tends to increase and points to an uniform equilibrium. <...> it says that everything decays and especially that heat tends to irradiate and dissipate" = lecture by Matteo Pasquinelli, "Introducing Four Regimes of Entropy: Notes for a Biomorphic Media Theory", 27 April 2011, Institute of Musicology and Media Studies, Humboldt University, Berlin

- negentropic persistence against entropic time ows its ahistoricity rather to its different form of registering: not by signals (recording the physically real acoustic event), but by symbols

- difference between mechanical (material) and electro-magnetic (almost immaterial) audio recording not just a technical, but as well an epistemological one. While the phonograph belongs to what Jules-Étienne Marey once called the "graphical method" (analog registering of signals by curves), the magnetophone is based upon the electro-magnetic field which represents a completely different type of recording; non-invasive writing has re-turned from within computing, as digital encoding

- occidental phonocentrism striving for means to store the human voice in the memory apparatus - be it the „dialogical“ hallucinations of *speaking with the dead* in historical imagination or the efforts to preserve folk song traditions in the age of enlightenment. Technical means since the nineteenth century made it possible to inscribe traces of the human voice both literally in the already established archival institutions of cultural memory and in the epistemological „archive“ (Foucault) as dispositive of cultural (re)cognition. This means that what looks rather unique, idiosyncratic in the case of Hornbostel´s ethno-phonographical archive, is to be read as part of an overriding practice of classification, data processing and information storage leading to early twentieth century efforts to create a universal documentation science.

- the "acoustic real" as registered in phonography extended to the magnetic cassette tape (where the noise of the apparatus and the inscription medium -

after high-frequency "sonic" pre-magnetization - is less co-present to human perception, thereby dissimulating the machinic, non-human sonic agency

- between mechanical and electro-magnetic audio recording not just a technical, but as well an epistemological difference; phonograph belongs to what Jules-Étienne Marey once called the "graphical method" (analog registering of signals by curves) and explicitely compared to a musical score, thereby integrating the graphical method in familiar cultural techniques of writing; when a record is not fixed any more on a permanent storage medium but takes places electronically; voltage replaces the stable inscription

- magnetophone based upon the electro-magnetic field which represents a completely different type of recording, in fact a true "medium". What used to be invasive writing has been substituted by electronic recording. This results in a different kind of contact zone between implicit sonicity and explicit sound

- when sound recording on gramophone disc re-sonates by replay, what happens between the pick-up of the technical device and the material sound wave recording on disc is different from reading a musical score by a musician or a musicologist; Fig.: Lautarchiv-Tonabnehmer.jpg Berlin

- music as concept and sound vs. event (sounds very Hanslickean); music: necessity for embodiment in order to become (e)motive: a correference between music and high-tec media in relation to their irreducible being-in-time to unfold at all

- sound technology provides music-makers with set of physical and psychological constraints but nevertheless allows a certain degree of agency / *versus* non-human agency of such machines

- May 2011 two Black Boxes could finally be rescued from the ground of the Atlantic sea two years after the Air France aeroplane crash: the data recorder and the voice recorder keeping the last words of the pilots in the cockpit but as well the background noises which retrospectively signal the unfolding desaster; recordings miraculously intact: memory chips which keep their magnetic charge, different from mechanically vulnerable previous recording media. Whereas mechanical records still represent the culturally familiar form of physical impression (writing), electro-magnetic latency is a sublime, uncanny form of insivible, non-haptic memory. The voices and sounds emanating from such a black box are radically bodyless, "acousmatic" in a new, informational sense, no longer in historio-graphical time; Brian Kane, Sound Unseen. Acousmatic Sound in Theory and Practice, Oxford / New York (Oxford UP) 2014; Murray Schafer's term "schizophonia"; shock induced by phonograph: the bodyless voice

- refinement of the Phenician syllabic writing system to the Greek phonetic alphabet by adopting individual letters to express single vowels (which Ong actually called a "technologizing of the word"), acoustic articulation (speech, singing, oral poetry) symbolically recordable for real re-enactment as a kind of "phonography" not *avant* but literally *à la lettre*. Still, this notation remained a symbolic code

- Béla Bartók on the memory conditions of the phonographic recordings of oral poetry made by Milman Parry which he transcribed into a symbolic musical score: "Aluminum disks were used; this material is very durable so that one may play back the records heaven knows how often, without the slightest deterioration. <...> copies can be made in almost limitless numbers"; physical reality of such storage devices over time is the evidence that they are increasingly subject to increasing physical entropy such as the material deteriorisation of Edison cylinders or magnetic tapes. And copying as act of tradition, for analog media, is subject to a negative signal-to-noise ratio. At that point, the strenght of almost lossless symbol copying becomes evident

Technological memory: The sound of the phonograph itself

- record in the Vienna Phonograph Archive of emperor Franz Joseph I of Austria-Hungary written deep into the wax cylinder (a recording from Bad Ischl, 2nd August 1903); instead of replaying this recording for historic reference, media archaeological listening starts here: phonograph as media artefact does not only preserve the memory of cultural semantics but stores past *technical* knowledge as well, a kind of frozen media memory embodied in engineering and waiting to be listened to by media-archaeologically tuned ears, waiting to be made explicit again

- Austrian emperor Franz Joseph's actual statement. Significantly, this statement - one of the first voice recordings preserved at all - tuns out to be the pure message of the medium. When a new technical medium emerges humans are very aware of its technicality (which afterwards, when it becomes mass media, tends to be forgotten in favor of so-called "content"). The emperor expresses his joy to literally "incorporate" his voice into the Vienna phonograph archive: "Es hat mit sehr gefreut, auf Wunsch der Akademie der Wissenschaften meine Stimme in den Apparat hineinzusprechen und dieselbe dadurch der Sammlung einzuverleiben." Indeed possible, today, to listen to human voices which exterminated hundred years ago, by applying laser reading of the wax cylinders which do not destroy its source in the act of re-play. But what do we hear: Message (the emperor) or noise (the scratch)?

- *paraisthesis* = noise of the wax cylinder itself which the record articulates whenever it is being re-played is not discursive (cultural) but media-archaeological information of the physically real event; not exclude it hermeutically like in the proverbial Cocktail party effect of auditory communication between humans; with the micro-physical *close reading* of sound, the materiality of the recording medium itself becomes archivally poetical.[19] Instead of musicological hermeneutics the media-archaeological ear listens to signals; power of signal-based technical media lies in their ability to actively (re-)create real presence; an unvolontary memory, thus: the memory of the real sonosphere which inadvertedly inscribes itself into the record: "There are many 'conversations' in addition to the songs incorporated in the recording, talks between collector and singer concerning data connected with

19 Karl Sierek, Die weiße Leinwand, in: ders., Aus der Bildhaft. Filmanalyse als Kinoästhetik, Wien (Sonderzuahl) 1993, 115-130 (122), referring to: Umberto Eco, Semiotik, 263 f.

the song, with the singer, with the circumstances referring to the performance of the song, etc. When you listen to these "conversations" you really have the feeling of being on the spot, talking yourself with those peasant singers. It gives you a thrilling impression of liveliness, of life itself." = Bartok ibid.

- Bartók's comment on his transcriptions of recordings of Yugoslav oral poetry from the 1930s: "You really have the feeling of being on the spot <...>. It gives you a thrilling impression of liveliness, of life itself" <op. cit.>.

- media archaeology, without passion, does not hallucinate life when he listens to recorded voices; the media archaeological exercise is to be aware at each given moment that we are dealing with technical media, not humans, that we are not speaking with the dead but operative recording keeps sound un-dead

The Aluminium disc

- 1934, Pyral Company of France and the Presto Corporation in the US, working independently, introduced an improved instantaneous disc which coated an aluminum base plate with a lacquer composed primarily of cellulose nitrate. Though highly flammable in its raw state and chemically unstable, this coating proved much more durable and easy to use than the uncoated discs, and was an instant success when introduced in the US late in the year. The two technologies existed side by side for several years, and uncoated aluminum recordings can be found dating as late as the early forties...but it was the lacquer disc that was adopted by the networks as their preservation medium of choice" = http://www.old-time.com/mcleod/mcleod6.html, accessed 12-10-06

- same Lincoln Thompson, who founded the Sound Specialties Company in Waterbury, Connecticut, and provided Parry with a direct cutting aluminium disc phonograph with two drives, "interested in developing technologies for the sound cinema; in my opinion, Thompson supplied Parry with the motion picture camera used for the "Kino" because of this interest (information e-mail 3rd January 2007, David Elmer)

Lord's Wire Recorder

- Parry „showed how it was possible to make a text out of oral poetry, evidently a contradiction in terms. The singer sings and the scribe records, whether on aluminum wire or discs or by means of graphemes on a flexible substance. <...> / There is no audience to entertain, except the recorder <...>, the recording of the poem is doing something to the shape of the poem" = Powell 2002: 6 f.; neither Parry nor Lord "interested in the nature or history of the technology that had made the text of Homer possible, any / more than Parry investigated the history of the recording machine" = Powell 2002: 7 f.

- Albert Lord "discovered a new way to make a text. He carried to Yugoslavia the best electronic recording equipment he could find, when <...> some songs were taken down on aluminum wire, others on metal discs. In the Milman Parry Collection at Harvard, Albert Lord showed <...> several rolls of this wire, hopelessly tangled in a drawer - what lost songs does this tagled text preserve?

Aluminium wire <...> is not oral song, but a kind of text <...>. Parry´s aluminum discs and wire, just as much as a papyrus with graphemes scratched thereon, provide a material basis - obviously liable to corruption - for a code impressed upon it. In either case the text depends on technological innovation: the Greek alphabet <...>, inscribed on parchment or papyrus, and electronic magnetization <...>. All texts are useless without the technology to decode its symbols: the rules of Greek alphabetic writing <...>, a tape-player <...>" = Barry B. Powell, Writing and the Origins of Greek Literautre, Cambridge u. a. (Cambridge UP) 2002, 6

- wire tape spaghetti in the Milman Parry Collection at Harvard; acquire a Webster Steel Wire magnetophon which is still operative; driving this heavy piece of post-alphabetic equipment to ex-Yugoslavia and Albania, to perform a reverse media archaeology of Parry (and Lord) recording Homer-like bards, by visiting the spots and recording (mabye the waves at the shores of Albania, which are closer to the spectrum of the electro-magnetic field, and the ultimate challenge to the vocal alphabet which could never actually write down the sound of breaking waves which - with Leibniz - can only be calculated or recorded by electro-magnetic media - a rupture in tradition under the guise of continuing it)

TECHNOLOGICAL WITNESSING OF POETICAL MEMORY: GUSLARI *ON-LINE*

Re-discovering the sound of texts: "Oral poetry"

- Florens Chladni experimented with his visualisations of acoustic wave figures in sand as created by the vibrations of the violin bow; „Goethe's definition of literature did not even have to mention optical or acoustic data flows"[20] which concern oral poetry; legends as oralized segments of bygone events, after the practice of oral tradition has been literally silenced by the general alphabetisation, „only survived in written format; that is, under pretechnological but literary conditions. However, since it has become possible to record the epics of the last Homeric bards, who until recently were wandering through Serbia and Croatia, oral mnemotechnics or cultures have become reconstructible in a completely different way"[21]

- The archive of recorded oral poetry from the former South Yugoslav countries located at Harvard University is called "Milman Parry Collection of Oral Literature". But media-archaeologically recognized, there is no text but recorded voices and sound, which only afterwards became transcribed into literature and musical notation (among others by Bela Bartók); textualization of oral traditions

Technically induced „secondary orality“

20 Kittler 1999: 7

21 Kittler 1999: 7, referring to: Walter]. Ong, Orality and Literacy. The Technologizing of the Word, London 1982, 27

- misunderstandig starts with the notion of "Oral Literature" (nomination of the Parry Collection at Harvard University). There is nothing "literal" in oral poetry, no letters, no alphabet, no recording. The message of the medium is neuro-temporal (realtime poetics), not spatially literal

- "musical" aspect of *guslari* performances lies not in its harmonic (melodic) but its rhythmic aspect - the chrono-poetic aspect of prosody

- note zu Ismail Kadare's novel *The File on H.*: "In fact, part of the Milman Parry Collection of Oral Literature at Harvard has been digitized, and it is now possible to hear some of their field recordings *online*!"[22]

Retextualizing audio(visual) records: Digitized sound

- active media archaeology (opto-digital reading of otherwise unaccessible sound recording) retrieves past sound signals by digital sampling and quantification; what appears to the ear like the restituted sound, is in fact the function of a mathematical matrix

- Fig. "Spektrogramm einer rekonstruierten Tonaufnahme (Wedda-Gesang, Ceylon 1907)" in: Stanke / Kessler, xxx; digital *close reading* of sound dissolves any signal into discrete blocks. Thus the textual regime returns (in alphanumeric codes)

- by optical reading of signals and application of digital filters, it is possible to digitally trace past acoustic signals from records. From such an operation we expect sound - just like the first officially archivized record of sound in Norway, a tinfoil flattened to a "document" and annotated by a remark by its former collector. The digital reading of this record by a laboratory in Southampton lead to a kind of re-sonification where the ear wants to detect something like music or speech but hear nothing but noisy patterns

- algorithmic archaeology is the return of "textuality" in the representation of the past, but this time, the text itself becomes media-active - a kind of operativity which the handwritten or printed text never knew. Digitized signals at first sight resemble the tradition of music notation; they wait to be algorithmically executed.

- early application of phonography for philological research, a recording of the oral poet Avdo Medjedovich in former Yuguslavia by Milman Parry and Albert Lord around 1935: *online* Milman Parry Collection of Oral Literature, Harvard University. In listening to such a sound, we tend to be trapped by the referential illusion, believing that we are confronted with the audio signal. But in fact discrete bit-strings are being processed - sublime textuality, operating on the subliminal level of our understanding; Leibniz, "nesciens" - mathematically calculating perception, breaking waves; how textuality becomes powerful beyond humans, within technomathematical machines

22 http://www.amazon.com/File-H-Novel-Ismail-Kadare/dp/1559706279; Zugriff 22 September 2006

- "[H]istory, in its traditional form, undertook to <...> lend speech to those traces which, in themselves, are / often not verbal, or which say in silence something other than what they actually say" = Michel Foucault, Archaeology of Knowledge, transl. A. M. Sheridan Smith [*1972], London / New York (Routledge Classics) 2002, "Introduction", 3-19 (7). Today, this is the relation between performative ("textual" or audiovisual) surfaces to what is being operatively processed on the other side of the coin, within the Central Processing Unit of microprocessors

Re-discovering the sound of "texts": Oral poetry

- technological dynamics of recording devices deserve close description to reveal its media-epistemologic potential for a refreshed terminology of "memory" and "time"

- escalation between the alphabetic "technologizing" of the spoken word (Walter Ong) and mechanic and electronic signal-recording of "oral poetry" (Milman Parry / Albert Lord in former South-Yugoslavean *guslari* culture); finally, creative algorithms mobilize the digitzed voices for a different kind of insight; still, the techno-traumatic event of the dis-embodied voice and the means its spectrographic analysis haunt cultural memory, since they remind of the technicity of sound within the human itself (like "thinking", with Turing / Lacan) = media-theoretical turn-around (*Kehre*)

- *gusle* in a vitrine of an ethnological museum is a mis-placement; like most other "historical" musical instruments, it actually has to be played in order not to decay physically. This form of direct use - which in case of techno-historical electronics means replacing some active or passive electronic elements (case of the archaic electro-acoustic instrument *Subharchord* in the archive of the Academy of the Arts, Berlin) - does what is strictly forbidden in traditional archives: to interfere with the original "record". The re-performance (signal processing) is the essence of musical and technical objects; the *archive in motion* is its only way of existence: active material philology

- *gusle* not simply a musical augmentation of the textual narrative in Oral Poetry but actually a functional device of re-actualizing (feed-back) this memory in acoustic re-presencing

- contrary to other forms of popular music which have become commercial audio-visual *turbo-folk* in the meantime, *gusle* resists becoming object of a media music industry, but only for discursive reasons: "It became a voice of the death, speaking to the living. Nationalistic rituals, in which the instrument played a central role, created an aura, which forbid its mixing with electronic instruments and new media" = Tanja Zimmermann, The Voice of gusle and its Resistance Against Electrification, in: Dimitri Zakharine / Nils Meise (eds), Electrified Voices. Medial, Socio-Historical and Cultural Aspects of Voice Transfer, Konstanz (Unipress) 2012, 403-410 (409). In media-archaeological terms, the very fact that the *gusle* has been recorded on aluminium discs (Parry) and magnetic wire (Lord) *undoes* this "resistance", rather revealing the affinity between electronics (oscillators, resonance circuit) and vibrational events in human / instrumental culture

- technically induced „secondary orality“ / media-archaeological *Kehre*: with phonograph recording (since Murko), a secondary (Walter Ong) or "derived" (Foley 1990) orality took place, revealing the phono-graphic (vibrational rather than phonetic-alphabetically discreet) nature of human "orality" itself

- hexametric verse as mnemo-technique, combined with *l'archive* in Foucauldean sense of a generative / conditionng grammar. Even the same singer does not repeat the same epic when performed (time-shifted) next time (re-generative); *variance* (Zumthor / Cerquelini) vs. technological *Gleichursprünglichkeit*

Speech becoming "immortal"

- acoustic records, since 1877, closer to cinematography (1895) than to other historical records, since only media able to register physically real signals can deal with time-based events like sonic articulation and movement

- technical media as archaeologists of sound: re-gaining acoustic information by laser-optical scanning from Galvano copper negatives

- If sound is kind of evasive, liquid, in itself unrecordable and transferable beyond the bodily range, then technical media (different from alphabetic phonetic writing which "freezes" the human voice, as expressed in the middle ages, by reducing it to a range of a very limited symbolic code) are able to de-freeze recorded voices in all its frequencies (that is, the Lacanean "real" of the voice) by re-play; after two millenniums of alphabetic sound recording there is a new kind of cultural technology as heritage of the Edison wax cylinder.

"Speech", as it were, has become immortal", Thomas Alva Edison announces in *Scientific American* of 1877 immediately after *finding* of phonographic signal recording.[23]

- the technical "undead" in signal recording media; interlacing of temporalities between (*a*)*live* and *recorded on tape*: "That is perhaps most uncanny when you hear a program about someone who is dead, and that person´s voice is broadcast and is as `real´ sensorially, as `present´, as those who are speaking `today´ and who are alive" = Weber 1996: 160

- Arthur Schnitzler, when speaking into the phonograph on 19th March 1907, admitted that confronted with the phonograph literature had lost its unique privilege to transmit the memory of human language: "Lebendige Stunden? Sie leben doch nicht länger als der letzte, der sich ihrer erinnert. Es ist nicht der schlechteste Beruf, solchen Stunden Dauer zu verleihen, über ihre Zeit hinaus."[24]

- ability, today, to listen to human voices which exterminated hundred years ago, by applying laser reading of the wax cylinders which do not destroy its

23 As quoted in Kittler 1986: 37

24 Track 3 auf CD *hörBar*, Signatur Ph 536

source in the act of replay. But what we hear is not simply the vocal message but the noise (the scratch) of the wax cylinder itself - which is no coded content from cultural history, but media archaeological information, an articulation of the techno-real itself. A task of media studies is to open the ears for such understanding

- micro-physical *close reading* of sound, where the materiality of the recording medium itself becomes poetical[25], dissolves any semantically meaningful archival unit into discrete blocks of signals. Instead of musicological hermeneutics, the media-archaeological gaze is required here - materially.

Trans-cultural musical memory? A techno-cultural paradox driven by traumatic "future in the past"

- avant-guarde of memory studies = trauma studies in connection with Holocaust; media-archaeological counter-hypothesis: fixation on a unique historical experience overlooks a deeper trauma rootet in the technological shock (since Edison's phonograph) and the "deadly" ambivalences of recording "live" itself

- effects and affects of re-presencing the past by media memory

- let the viewer / listener be co-affected or even be "co-traumatized" (Jan-Claas van Treeck); stems from the technological setting itself which continuously challenges and irritates the human sense of presence

- recording projects in ethno-musicology; Berlin Lautarchiv (resulting from prisoner recordings in World War One) a technological function of traumatic anxiety about the disappearance of indigenous cultures, resulting in techno-archiving practices in the temporal mode of "future in the past"

- like the phonographic archives established in Vienna and in Berlin around 1900, the photographic expeditions undertaken by Albert Kahn for his *Archives de la Planéte* in the 1930 and further projects, Bowles' Marroccean folk song recordings was driven by a kind of anticipatory trauma that the indigene culture he referred to was about to be extinguished. Apparently he never listened himself to the tapes he feverishly recorded; almost forgotten they time-invariantly rested in magnetic (rather than cultural) latency until they were discovered for re-play

- not "collective memory" but a collection of recordings in technical storage - meant as memory of an anticipated *futurum exactum*, driven by a virtual trauma; reverse: the current "Retromania" (Simon Reynolds) in popular music which compensates for the absence of utopean or avantgardist perspectives in current musical culture - a thought expressed by Jan Rohlf for the 2014 theme of CTM - Festival for Adventurous Music and Art "DIS CONTINUITY", Berlin (January / February, 2014)

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25 Karl Sierek, Die weiße Leinwand, in: ders., Aus der Bildhaft. Filmanalyse als Kinoästhetik, Wien (Sonderzuahl) 1993, 115-130 (122), referring to: Umberto Eco, Semiotik, 263f

- "The archival potential of such <sc. phonographic> recordings came at a time when many indigenous cultures were already severely threatened, or had already disappeared, ironically as a result of the same Western industrialization that produces the technology used for the documentation. [...] the fact remains that the technology provided a literal documentation that surpassed the results of even the most sensitive transcriber. <...> many ethnomusicologists were so conditioned by Western muscial practice that they intepreted what they heard and transcibred it according to Western musical notation, ignoring the microtonal variations that can still be heard on original recordings. Therefore, such objective documentation can be said <...> to preserve the aural artifacts of a culture" = Barry Truax, Acoustic Communication, Norwood, N. J. (Ablex) 1984, 118 - in facts its sonic *aura*. The technical recording (that is, the media-archaeological ear) preserves acoustic signals which might have already been obscured by symbolically coded cultural memory. Even if "[t]here is no guarantee that one can ever bridge the gaps between cultures" - and temporal distance between sonic articulations -, "the perspective of time and familiarity can certainly clear a way some of the veils that obscure a culture from us" = Truax ibid. - revealing the sonicity of the cultural unconscious.

- like Alan Lomax' notorious recording of American folk songs had been commissioned by the Music Division of the Library of Congress, same institution let an American resident in Tanger, the writer Paul Bowles, record native Maroccean folk songs and rhythms on magnetic tape (financed by a Rockefeller Fondation Grant) in 1959. Bowles' initiative was driven by the fear that recently independent Marocco was about to destroy that native folk music culture in an effort of national modernization

- Even if Bowles got copies of all the tapes he sent to Washington, he never listened to one of them again. The issue was conservation (German "Tonkonserve"), materially canning the acoustic event, for a (principally) infinitive time interval. A different kind of *non-living* memory is at work here, in both cultural and magnetic *latency*. When there was not alternating but direct current in some of the local villages, no recording took place at all with the AMPEX magnetophone equipment.

- Such anticipatory technological recording while the culture itself is still intact, escalated in ballistic World War II anti-aircraft prediction. In order for the artillery to fire is bullets "just in time", the data of the approaching enemy aircraft had to be recorded and calclated in real time to anticipate its future position. This corresponds with the temporal grammar of *futurum exactum*, the "future in the past" - that which will have been. History not in the past any more but anticipated in a projected future

- this temporal figuration became more time-critical in the subsequent World War II when electronic Analog, then Digital computers performed predictive calculation of enemy moves in real time, applied to anti-aircraft defence, by literally *calculating* future in the past - like nowadays the predictive analytics algorithms exercised by the NSA in the survey of current telecommunication data; no archive from the past but actually an archive of the future

- techno-cultural *dissonance* roots in the fact that the very audio-visual "new

media" of documentation were part of the same modernization and industrialization which is responsible for the destruction of more traditional ethnic cultures constituting the object of recording

- Inbetween use of material (museum), signal-based (audio-visual recording) and symbolic (alphabetical) records to replace a living cultural memory by manipulatable storage, is was the case for the present with the *Theresienstadt* ghetto film from 1944/45 and the Central Jewish Museum project in Prague under German occupation 1940-43 to create a *futurum exactum*

- Albrecht Meydenbauers German Monument Archive (das Deutsche Denkmälerarchiv), based around 1900 on photogrammetric measuring of historic architectural heritage, anticipated future destruction of the originals caused by possible wars already. The pre-emptive media archive embodies the time-reversed trauma, known from grammar as "future in the past" *(futurum* exactum); from the technological condition of photography, cinematography and phonography itself that the traumatic *futurum exactum* as a kind of reverse non-historical trauma arose: the concept that a cultural articulation might *possibly* be extinguished and thus in anticipatory ways needs technical pre-recording

Disembodied voices from analog to digital analytics

- German Service of the BBC recorded voices of survivors immediately after the liberation of the concentration camp Bergen-Belsen and broadcasted them repeatedly *via* radio

- photo-/phonographic (logo-centristic / presentistic) momentum: The recordings made almost immediately after the event, says the according CD Booklet, are "much more authentic than more recent statements of 'witnesses' which have been transformed by new experiences and mental processing"[26] - signal-witnessing. The recordings of the Jewish cellist Anita Lasker and Lotte Grunow are preserved in the Phonothek of Deutsches Rundfunkarchiv in Wiesbaden.[27] The booklet of its edition on Compact Disc tries to catch the medium specificity of such *signal memory*; referring to tape system-internal recordings "which illustrate the 'spirit' and character of the regime much more impressively than any printed text might ever achive"[28] - or archive

- On track 21 concentration camp survivor Lotte Grunow expresses her dispair with trying to organize her fresh memories into a narratable form: "Da weiß

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26 In German: "[...] um ein Vielfaches authentischer als andere, durch neue Erfahrungen und gedankliche Verarbeitung überformte Statements of 'Zeitzeugen'."

27 They have been published on Compact Disc by the Institut für Zeitgeschichte (Munich / Berlin) 2003 *Dokumentation Obersalzberg. Tondokumente. Täter Gegner Opfer*, ed. by Albert A. Feiber / Volker Dahm, track 20 and 21

28 "<...> die <...> 'Geist' und Charakter des Regimes sehr viel eindringlicher veranschaulichen, als dies ein gedruckter Text je könnte"

man nicht, wo man anfangen soll" ("One does not know where to begin"). This fundamental *aporia* marks the traumatic *momentum*. At several instants of the recording, her voice seems to hesitate or to double for a micro-phonetic moment.

Is this an index of *read* text, of traumatic speech iteration, or a technical effect of digital buffering of the audio file itself? In the latter case, the apparent traumatic shock turns out to be a function of technology itself.

A techno-sonic analysis of such recorded voices allows for the memorization of such traumatically experienced presence in revealing subtle nuances of voicing (somewhat deconstructing the message of the official "acousmatic" commentator voice from the *off*[29]).

Instead of traditional alphabetical transcription, linguistic analysis software like Praat allows for (and incites) new kinds of rather signal- than archive-b(i)ased mobilization of recorded memory: phonetic speech analysis, active archaeology of past sounds. In such algorithmic analysis, audio recordings from the the past are not just archival objects any more, but become items in an experimental laboratory of "archived presence". Semantic emphasis can be identified as a function of tonal pitch in the recorded voice, just as Max Planck - in a recording from 1939 in the Lautarchiv collection "Stimmen berühmter Persönlichkeiten"[30], raises (in German: "erhebt") his voice with the very German word "erhebt" itself, and lowers it with rhetorical skill at the end of his phrase in the last word "Gelehrten" (scholars). The techno-mathematical analysis of intonation, performed by Nikita Braguinski with the software Sonic Visualizer, reveals Planck's application of quasi-musical phrasing and thereby bridges the gap between semantics and affect; "Avdo movie" with abrupt technical ending

- apply such sonic analytics to sonic records from traumatic past as well. Recent experiments with the "archival" *a priori* of digital audio memory organization have resulted in more dynamical tools of inquiry: search algorithms which are closer to the mechanism of human remembrance which is always in motion itself.

- automatically tagging both intentional and non-intentional (even traumatic) "silence" in audio files - inaudible sound where nothing but time (and the recording medium) speaks, as provided by the "Analysis"-toolbar of the audio software Audacity under the explicit term of "Silence Finder"; might be applied to the magnetic tapes from the historic Frankfurt Auschwitz trial

- "Effects" tool, on the other hand, allows for "removing silence" or to create "echo" from audio signals, which is manipulation of the sonic time event on its minutest level. The "echo" itself embodies the time figure of delayed presence or even "archiving presence": Only recorded presence can be echoed. In reverse, the echo is a temporal mirror of presence itself, thereby undercutting the clear observational distinction between presence and past which is emphasized by systems theory (Spencer-Brown / Luhmann).

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29 See Michel Chion, Audio-vision. Sound on screen, New York (Columbia University Press) 1990

30 See Web site of the Lautarchiv = B8-29 Max Planck

Is such *cultural analytics* (algorithmic analysis as defined by Lev Manovich) un-ethical when it comes to traumatic testimony like audio and video recordings of Holocaust survivors?

- Todd Presner, The Ethics of the Algorithm: Close and Distant Listening to the Shoah Foundation Visual History Archive, typeskript (conference paper draft, March 2012, http://www.toddpresner.com/wp-content/uploads/2012/09/Presner_Ethics.pdf

- Derrida definies his sensation of the *anima* in voice recording: "I am always overwhelmed when I hear the voice of someone who is dead, as I am not when I see a photograph or an image of the dead person"[31]

- in spite of the Barthean *punctum*. Visual presence is based on electro-magnetic wave signal transmission ("radio"-like): almost immediate, whereas acoustic sensation is based on slow run-tíme in mechanical matter: "I can be touched, *presently*, by the recorded speech of someone who is dead. I can, *here and now*, be affected <!> by a voice beyond the grave"[32]; according to an hypothesis developed by John Durham Peters, this double *media* only takes place with analogue media and abruptly ends with digital data processing

- in signal recording, *in*distinction between message and noise, referential recording and the articulation of the recording device itself - while binary data - though technically still being embodied in electrophysics and driven by current energy - *per definitionem* in communication theory abstract from the material implementation

- recording of the acoustically or optically "real" physical signal is opposed to symbolic notation by the alphabet not only in a technical but also in an epistemological way: the difference between physical signal as indexical and the arbitrary cultural symbol. With computing, though, this dialectic opposition becomes synthesized, since Digital Signal Processing (notably sampling of audio events) is a function of discrete symbolization, a re-entry of the "alphabet" in numerical and logical form. If according to Walter Ong the electronic revolution in mass media communication devices like radio and television has led to a "secondary orality", communication based on the symbolic machine (computing) has led to a (hidden) secondary alphabetic revolution, with bits and bytes inheriting the typeset, but different from the printing culture in a dynamic way. The voice turns silent and still articulates - in implicity mathematical sonicity which is the ultimate shock to occidental logocentrism.

Singers and Tales in the 21st Century: digital memory

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31 Jacques Derrida, Above all, no journalism, in: H. de Vries / Samuel Weber (eds), Religion and Media, Stanford, CA (Stanford University Press) 2001, 56-94 (71). See Paddy Scannell, Television and the Meaning of Life, Cambridge (Polity) 2014, 126

32 Derrida 2001: 71

With digitization, a dramatic change of memory records takes place. We can focus the exact moment of metamorphosis where "big data" of past recordings are generated and social memory is transformed into computability; not just a further escalation of the pick-up / record groove constellation, but in fact an epistemological *transsubstantiation*. This statement may seem "metaphysical", but no less mind than the philosopher Leibniz (who designed the first binary calculating machine) was convinced that the language of metaphysics could be completely mathematized itself. Even with infinite approximation an algebraic *calculus* will never equal the physical world. "Womöglich sind Wolken keine Computer, die jeden Regentropfen berechnen, und umgekehrt Computer keine Maschinen, die Wolken das Regnen abnehmen" = Friedrich Kittler, Ein Tigertier, das Zeichen setzte. Gottfried Wilhelm Leibniz zum 350. Geburtstag, in: *mtg* (Medien/Theorie/Geschichte) Nr. 3 des DFG-Projektverbunds *Theorie und Geschichte der Medien* (1996); http://www.uni-kassel.de/wz2/mtg/archiv/kittler.html

Once a human epic performance is being recorded, it becomes post-memorial and technical storage instead. The carrier of the cultural information is not a human signal (voice and gesture) but magnetic tape. With digitization, an even more dramatic change takes place which transcends the transduction of epic songs from Gusle string to steel wire:

- same kind of steel wire which has been the basis for Albert Lord's magnetic recordings in former Yugoslavia in 1950 is all of the sudden used for a grid which constitutes the Cartesian x / y texture of the earlieste electronic computer memory, so-called Magnetic Core. Ironically, this digital memory hardware has become the media-archaeological condition for a "social memory" of a second order such as the "Community Memory" project, a telephone-line, Modem- and computer-based social network which emerged around 1970s in the San Francisco area, figuring centrally a Time-Sharing main frame computer (the SDS 940). What has been "collective memory" in sociological terms has become cold storage, and the use of the term "memory" for both implementations (human bodies and minds vs. hardware) is rather misleading.[33]

As RAM the SDS 940 consisted of magnetic core memory units; its very image internally "mirrors" the social "net-work" literally = Höltgen 2014: 397 f.;

Höltgen 2014: 398, Fig. 5. This is truly and non-metaphorically called "social memory 2.0", since memory here is a direct function of the capacities and limits of the computer data storage.

From sich recording situation arises the „archival“ question: What happens to oral poetry when the "online"-performance (on the *gusle* string) and the "online"-recordings (literally Lord's wire spools) become accessible "online" in the World Wide Web sense? Does the media-critique of writing as recording

33 See Stefan Höltgen, "All Watched Over by Machines of Loving Grace". Öffentliche Erinnerungen, demokratische Informationen und restriktive Technologien am Beispiel der "Community Memory", in: Ramón Reichert (ed.), Big Data. Analysen zum digitalen Wandel von Wissen, Macht und Ökonomie, Bielefeld (transcript) 2014, 385-403 (386)

device, articulated once by Platon in respect to the ambivalence of alphabetic notation as cultural technique of memory, become valid again?

- tradition of songs and tales, for millenia, by mnemotechnics of oral transmission, increasingly accompanied (supplemented, deferred) by notational writing (the vocal alphabet, musical notes). The early 20th century enabled a media-induced re-entry of orality, a secundary orality (Walter Ong) based on analog recording technologies like phonography, magnetic tape and kinematography. In late 20th century, the symbolic notation took revenge by its re-entry: in the form of the alphanumeric code within computing. The digitization of the audiovisual legacy of Parry and Lord on aluminium discs and wire spools makes a difference to the essence of its cultural content; Plato's primary „media“ critique of writing as an ambivalent memory technology is valid again.

P.S.: Re-play (Hamdo 2006)

- mathematically discovering sub-semantic poetic articulation; stochastics (Markov-chains) to simulate actual choice / prosodic decision in *formulae* of oral epics; senso-motoric feedback *gusle* / *guslar*; cybernetic coupling / arbitariness vs. probability (like plugging the string itself: d'Alembert / Euler; Siegert 2003)

- almost surrealist proximity of the Gusle and the wire recorder and created a new image: the mysterious correspondence between the string (horse-hair chord) that was being bowed and the recording wire (steel); artistic craft expressed precisely in the playing of the instrument, and its was the wire recorder that recorded exactly this momentum: the circle of vibrations in technology and poetry was thus complete; the most human was at the same time the most inhuman - precisely the coldest media archaeology ear was listening to the most magical of all sound machines

Archival phantasms / auditory hallucinations

- main task of the traditional archive so far: keep legally valid documents intact for proof and re-use. Once the archive is being searched for different purposes, mainly by historians, this leads to a misreading of its administrative nature. The aesthetics of the archive is radically non-narrative. Transforming such records into a historiographical narrative is an act of mis-reading the (in)formation of the archive in an effort to humanize it

When French historian Jules Michelet visited the parliament archives in Paris to write abut the recent past of the French revolution, he almost believed he could hear the obstinate murmur of documents, the voices of the dead - as if recorded on gramophone, so to speak. Romantic historical imagination, in many ways, prefigured the technological media of later epochs = Kittler, Discursive Networks

By vocalizing silent archival records in his reading performances (his *Memory Arena* series) the media artist Arnold Dreyblatt imbues memory with a diversity of voices; "speaking" archive is a hallucinogenic form of memory, resulting

from the cultural-poetic (or rather prosopo-poietic) phantasms of trying to "speak with the past", as confessed in the introduction of Stephen Greenblatt's *Shakespearean Negotiations* which became a pamphlet for the method of "new historicism" in literary studies: "It all began with the desire to speak with the dead" = Stephen Greenblatt, Shakespearean Negotiations. The Circulation of Social Energy in Renaissance England, Berkeley 1988, 1: "I began with the desire to speak with the dead. <...> If I never believed that the dead could hear me, and if I knew that the dead could not speak, I was nevertheless certain that I could recreate a conversation with them."

Motion and immobilization: the audiovisual archive

Whereas the scripture-based classical archive is a static array of records on the grand scale and letters on the microscale, which could be brought in motion only by the act of human reading line by line, the Edison phonograph looks like the first form of "archive in motion", since its recording (notably the early ethnographic field recordings around 1900, leading to the Vienna Phonograph Archive and the Berlin Phonogramm Archive) is based on a rotating, technically moving apparatus both in recording and in re-play; parallel to early cinematographical recording and projection.

- In media-archaeological awareness, such a recording primarily memorizes the noise of the wax cylinder itself - which is different kind of "archive", not cultural-historically, but cultural-technologically, a different kind of information on the real. Media archaeology opens our ears to listen to this as well, not to filter this out.

Thus the phonograph as media artefact does not only carry cultural semantic like words and music, but - like any work of art - is at the same time an archive of cultural engineering as well, by its very material fabrication - a kind of frozen media knowledge, which - media-archaeologically - waits to be de-frozen, liquified.

Different (media-)archival tempor(e)alities: As opposed to an "archival" transcription of, for example, oral poetry by alphabetic or musical notation, its recording by phonograph or gramophone creates a presence in latency, a different temporality, since these sources can be re-played with equal originality (*gleichursprünglich*): Repetition with difference on the macro-temporal time axis, but identical reproduction of its inherent temporal event, invariant towards "history". Bela Bartok once transcribed Yugoslav folk music of gramophone recordings (both from aluminium disc or later from electromagnetic wire recorder) in the Milman Parry Collection at Harvard University (Cambridge, Mass.)[34] , thereby translating the physically real articulation into the symbolical regime which increases "information" in terms of order and selection, but looses additional information like the individual intonation, the temporal subtilities and the accidents, the "noise" as the authential trace of the unique performance event. Listen to the coffing when the *guslar* (singer) Avdo Mededovich starts to perform in one of the recordings:

34 Bela Bartok, Parry Collection of Yugoslav Folk Music, New York (New York Times) 1942

Since the age of technical reproducibility of movement and sound, cultural memory has been liberated from restrictions to symbolical notation which leaves us with a bifurcated memory: the symbolical and the real.

Provided that there is still a player, the recordings themselves can be originally be replayed and re-transcribed in completely new, variable ways. The acoustic event can be measured by oscillographical visualisation or spectral analysis:

Even Avdo's caughing thereby is subject to techno-mathematical, non-cultural analysis

- first uses of sound film for musicological documentation = "Avdo movie", Milman Parry Collection website:

"Ej, kad svati na Rasku dodose
 Avaj, Jaca Seremeta pita <...>."

"When the wedding-guests came to Raska
 Alas, Sava inqured of Seremet <...>." (Transl. by A. B. Lord)

At 1:20 min. the sound recording abruptly ends in the middle of a verse line ("Ni bih ..." / "Nor would I ..."), while the sound of the rotating disc takes over rythmically: Now the medium speaks.

And a few seconds later (1:37), the kinematographic recording breaks down as well. With that rupture, the real of the medium is at work, and physically breaks into the symbolic cultural scene. Watching such a record, an anthopological mis-reading happens: We tend to forget about the recording apparatus and concentrate on the body and voice of the singer, looking at him as if he was still alive, being touched by his performance which is in fact nothing but a technological re-play. Thus let me contrast this emotional audiovisual record by showing such a recording as a technological event

- constant reminder that there is no human voice but a machinic voice, in the sense of the transduction of body-based voices into a electronically reprocessed voice. The frequencies, even the timbre of the voice, miracolously, is still the same in both "media"

- Albert Lord on the recording of Yugoslav guslari: Unintentionally, the recording turns improvised oral poetry into a fixed text like the jazz improvisation recorded and electronically mastered provided for a immutable reference version and photography freezes a moment of live into a still. "Proteus war photographiert worden [und] an dieser Aufnahme wurde hinfort jede Veränderung gemessen - sie wurde zum "Original". Albert B. Lord, Der Sänger erzählt. Wie ein Epos entsteht, München (Hanser) 1965, 185; AO: The Singer of Tales

- electromagnetic recording preserves unique feature of the oral performance (different from its alphabetic, immobilizing transcription) which can be derived from how French language calls the recording device: *écriture magnétique*. Electromagnetic recording, by its very physical immateriality, only comes into

existence as part of a dynamical process, the *inductive* act of re-play ("writing" different from "printing"). In his preface to Albert B. Lord's *The Singer of Tales* Harry Levin remarks: "The Word as spoken or sung, together with a visual image of the speaker or singer, has meanwhile been regaining its hold through electrical engineering."[35]

- notion of the archive is in transition. As long as there have been symbolical, alphabet-based archives only, the phantasma of recording the acoustically real (predominantly the human voice) has generated imaginary forms of memorizing sound in supplementary ways.

Technology is within two temporal forms of existence. Hardware (*techné*) is subject to entropy; the symbolic code (*logos*) survives.

With the necessity of digitizing phonographic records in order to preserve them against physical, media-archaeological entropy, a new epistemological option emerges which demands media-theoretical attention,

- as expressed in the presentation of the SpuBito project of www.gfai.de:

"The retrieved sound documents can directly be stored on digital media (e. g. CDs) for archiving or processing" - the "archive in motion" indeed

With algorithmically driven ("automated") tagging (mark-ups), a set of metadata gained from *within* the auditive signal event reveals its inherent spatial geometry and temporality. Such digital archaeonautics is the opposite but may be combined with "social tagging" in Open Access Web 2.0 circulation which is non-classified in similar ways: a hybridisation of order and random access, of techno-logical and "collective" memory.

When it is not historians but software as archaeologist which listens to audio(visual) recordings from the past in the method of sonic analytics applying linguistic software such as Praat,

- on the linguistic field that the first computational algorithms for voice recognition have been developed

- Folke Müller, Die Tonhöhe historischer Filmstimmen als soziolinguistische Variable, in: Zakharine / Meise (eds) 2010: 233-247

Reverberative memory

- towards a non-anthropocentric and technomathematical theory of cultral transmission

- Milman Parry's and Albert Lord's phonographical and electronic recording of the oral poetry of the southern Yugoslavian guslari culture in the 1930s; yet they accessed this culture through transcriptions that focused on words only: philology neglected the vocal micro-timings and the one-stringed Gusle

35 Boston (Harvard University Press) 1960, xiii

instrument that was integral to the performance. Reverberative memory can only preserved by signal recording. The sonicist relation between present and past is based on resonance: a non-historicist figure of time that is itself temporal in its articulation. Sonicity, with its time-critical qualities, is here a metonym for the temporality of the world as event. This perspective is further underscored by the mnemo-generic capacities of recorded sound and in particular digitized sonic materials that are susceptible to the operative memory of algorithmic procedures.

Sóonia Matos on the archival potentials of a purely sonic language in danger of extinction, namely the whistle language known as Silbo Gomero that is still partly in use on the La Gomera island, in: Ina Blom et al. (eds.), Memory in Motion, AUP, 2017. This language composed of sounds that have no relation to alphabetic transcription; its articulation is also much a function of the spatial context (echo and reverb). Linear recording and storing of linguistic units fails to convey the actual functioning of the language in acoustic space; discard traditional ideas of archival preservation that usually support the protection of endangered languages

TOWARDS A MEDIA-ARCHAEOLOGY OF SIRENIC ARTICULATIONS

- sonic media archaeology not simply about the re-sonification of materialle obsolete first recordings or even prephonographic sound inscriptions *avant la lettre* but re-tracing the *arché* of sound as temporal event

- "Siren" sound better understood by radio waves

- not accidentally, question of the acoustic authenticity of the Siren motive in Homer's *Odyssee* arose within grammophone and radio culture, which for the first time made the voice not symbolically (alphabet), really recordable

- measuring Siren singing: "The white noise signal recorded between the two smaller islets showed higher amplitudes in the 1000-5000 Hz frequency range than the same signal recorded just in front of the islands (fig. 3). The natural signals (human voices and seal calls) were louder at the positions between and just behind the two smaller islands [...] than just in front of them [...]. This result can be seen clearly in the lower harmonics where the main energy of sound is located. The changes in loudness were distinctly perceived even to the naked ear. Our results lead to the conclusion that the specific geographical constellation of the island acts as an acoustic amplifier [...]."[36]

"As a matter of fact, [...] intervals given together by two [sc. technical] Sirens at Li Galli can only be differentiated as being 'accords', that means having two separate sources, if their overtone structures do not merge. This is [...] the case [...] at first with the third and further with less 'consonant' intervals counting up the overtone series. Since the pure major and minor thirds are typical for enharmonic scales and less ‘consonant’ intervals are not likely to be

36 Karl-Heinz Frommolt / Martin Carlé, The Song of the Sirens, paper proposed to the xxx conference at Munich, year xxx

of great use for any harmonic accompaniment, this finding adds to the evidence that (i) pure thirds are the characteristic intervals of enharmonic tuning in Ancient Greece and (ii) that it has been developed from an early diaphony for which next to the double-aulos the casus dualis in the song of the two sirens holds."[37]

Sirens with Blanchot: "[...] parce que les Sirènes qui n'étaient que des bêtes [...] pouvaient chanter comme chantent les hommes, elles rendaient le chant si insolite qu'elles faisaient naître en celui qui L'entendait le soupçon de 'inhumanitè de tout chant humain."[38]

- Ernle Bradford reports that he heard the Sirens sing while serving on H.M.S. Exmoor in early September 1943 in the Gulf of Salerno: "[...] there was about it a human quality, disturbing and evocative"[39]

- media-archaeological question arises: It there something like a physically given setting, a grounding in the "real" of signal processing, that kept cultural memory insisting on that place and which only sonic measuring media can reveal (analog to Benjamin's notion of the "optical unconscious" which can only be detected by the camera lense[40]); "grey zone between natural sounds and specifically addressed messages with a human quality. "Meaning emerges from noise and reinforces its content by activating a cultural memory of antiquity - a Lacanian transfer from the real (waves) over the symbolic (encoded communication) to the imaginary [...]."[41]

- on the literally "symbolic" level: between *Iliad* and the *Odyssey* lies the invention of the Greek alphabet, i. e.: the adding of vocal symbols to the syllabic Phenician alphabet in order to record the musicality of Homer's oral poetry = Barry B. Powell, Homer and the Origin of the Greek Alphabet, Cambridge 1991. Sirens are literary expressions of this vocality. A sonic media archaeology of the *Odyssey* has to confront an (a)historic dilemma: How can an acoustic event which is supposed to have happened before the age of gramophonic recording be verified? test and reconstruct such acoustic events by media-archaeological means — a sound analytical provocation to classic philology

- the myth "echoes" actual acoustic phenomena on the site. For such a precise location of cultural memory, there must be a foundation in the acoustic real

- Sirens "non-human" in terms of machinic or cyborg sound. What makes the mythologic Siren motive relevant for present media archaeology of sound is the intervention of the phonograph, since for the first time, the replay of recorded voices was considered like the presence of humans while at the same time

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37 Frommolt / Carlé ibid.

38 Maurice Blanchot, Le live à venir, chap. I "Le chant des Sirènes", section "La Rencontre de l'Imaginaire", 9-18 (10)

39 Ernle Bradford, Ulysses Found, London (Hodder and Stoughton) 1963, 130

40 Walter Benjamin, Kleine Geschichte der Photographie, in: Gesammelte Schriften vol. II/1, Frankfurt/M. [*1972], 2nd ed. 1989, 371

41 Winthrop-Young, op. cit.

knowing it is reproduced from dead signals on a storage medium - and even more with electronic sound processing. Here, the uncanniness of the monstruous Sirens corresponds with the imaginary of technology itself. "imaginary media" (Jussi Parikka) such as the mythic Sirens address the non-human side of technical media; the fact that technical media are media of non-solid, non-phenomenologial worlds (electro-magnetic fields, high-level mathematics, speeds beyond human comprehension"[42] - which, beyond the phonograph, is true for electronic sound media up to the digital sound processing of today with "ultra-sonic" speed of processing.

- zone of indeterminacy between human and non-human sound is what Maurice Blanchot once identified as the "acoustemic" core of the Siren songs. Blanchot takes into account the notion of human singing turned upside down: "Some have said that is was an inhuman song - a natural sound [...] but on the borderline of nature, at any rate foreign to man; almost inaudible [...]. Others suggested that it [...] simply imitated the song of a normal human being, but since the Sirens, even if they sang like human beings, were only beasts [...], their song was so unearthly that it forced those who heard it to realise the inhumanness of all human singing."[43]

- vocal effects of presence achieved even by completely computational artefacts. Uncanniness derives from the technological Turing test.

- Kittler: Sirens are examples of "resursive history 'where the same issue is taken up again and again at regular intervals but with different connotations and results' [...] to the nineteenth-century technical use of the term in the form we understand it, i. e. as a signalling device with a sound, subsequently playing a key part in the mapping of the thresholds of hearing [...]."[44] This re-occurrence, though, is not within history, but in a coupling of human cultural time and a non-human evidence.

Fig.: Vocal Siren, from: Hermann von Helmholtz, Ueber die physiologischen Ursachen der musikalischen Harmonie (lecture 1857), in: Vorträge und Reden von Hermann von Helmholtz, vol. 1, 5th edition, Braunschweig (Vieweg) 1903, 119-155, Fig. 1

- the agency of sound-archaeological research is the technical siren apparatus indeed to synthesise vowels - especially in the double siren version as developed by Hermann von Helmholtz, remarkably corresponding with the *casus dualis* of the Homeric Sirens

- explicit harmonic analysis of acoustic vibrations (in adoption of Fourier's mathematical analysis) for the sensation of hearing "tones" achieved by G. S.

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42 See the chapter: Non-human media, in: Jussi Parikka, What is Media Archaeology?, Cambridge / Cambridge, Mass. (Polity Press) 2012, 55-61 (62)

43 Maurice Blanchot, The Sirens's Song. Selected Essays, Bloomington (Indiana University Press) 1982, 59-65 (59)

44 Parikka 2012, 67, quoting John Armitage, From Discourse Networks to Cultural Mathematics. An Interview with Friedrich A. Kittler, in: Theory, Culture & Society vol. 23, no. 7/8 (2006), 17-38 (33)

Ohm, Ueber die Definition des Tones, nebst daran geknüpfter Theorie der Sirene und ähnlicher tonbildender Vorrichtungen, in: Annalen der Physik und Chemie, vol. 59 (1843), 513-565

- experimental settings of the Li Galli expedition has been to fold both meanings of the "siren" upon each other - the cultural and the artefactual one, by emiting across the island, acoustic impulses generated by the technical double-siren.

With the technical siren as *sonic* device (developed by Cagniard de Latour and refined by Hermann von Helmholtz) the vocal formants became mathematically analysable and thus calculable, with a retro-effect towards the metaphysics of the voice in occidental ontology: Since then, a human voice is considered and perceived as a frequency-based vibration event in itself, no less "mechanical" than technical machin communication and recording like telephony and the phonograph. When the technical siren as acoustic pulse generator confronts its mythological other, the Homeric Sirens, the myth itself fails and dissolves into a knowledge-driven material and dynamic construction of a signal event which is not controlled but simply modulated by humans; not invented, just dis-covered in culture. Geoffrey Winthrop-Young points out the special twist of this forensic Siren analysis: "[...] one of the sound-producing devices used to disconceal the ancient Sirens was an aerophone, a noisemaker that produces signs by interrupting the air flow—in other words, a modern siren. Sirens track Sirens" - which is both acoustic media archaeology and media archaeology of the acoustic.

- S/sirens: The typographic slash both folds and breaks cultural discourse and techno-logical implementation. Against the suggestions of the historic timeline, "[r]ecursions fold time and thus enable direct contact between points and events (and S/sirens) that are separated when history time is stretched out on a continuous line."[45] Such a procedure was carried out on a technical level: sound-producing technologies were used to project sounds to and from the Li Galli islets while being recorded by storage devices. The subsequent technical analysis of the recordings produced an truly techno-logical insight: "Sounds emanating from the main island Gallo Lungo hit the Siren rocks Castelluccio and La Rotonda and, much like a ball caught between the flappers of a pinball machine, start to echo between the two, resulting in the disorienting sonic phenomenon experienced by Bradford [...]"[46], while even more addressing ears which are *turned* by the archaic Greek theory of musical sound ratios closer to Pan's *double* flute *(auloi*) than to the classic Apollinic lyra

In terms of cultural techniques, the condition for such an awareness was the phonetic alphabet[47]; the mythological Sirens are a (auto-)poietic function of phono-graphy *avant la lettre*; ancient Greek notational practice of the vowel alphabet in use both for musical and for speech notation set an epistemological *a priori*. From the point of view of the archaeology of knowledge, this kind of vocal analysis does not contain its *telos* in the phonograph, spectrogram and Vocoder but remains within the regime of the symbolic (thus "cultural") order. It

45 Winthrop-Young, op. cit., note 5
46 Winthrop-Young, op. cit.
47 See Walter Ong, The Technologizing of the Word, London 1982

is the radical break with the phonetic alphabet, a paradigmatic shift / replacement by a truly media-technological, indexical relationship to the sound of the voice, that the phonograph resulted - with the allegorical design as "Siren" or "Loreley" just being a mythological re-call.[48]

In section XIV of his essay on *The Work of Art in the Age of Mechanical Reproduction*, Walter Benjamin, there are "critical epochs in which a certain art form aspires to effects which could be fully obtained only with a changed technical standard"[49]. This happens on the level of the symbolic signifiers as well. The alphabetic vowels transposed Homer's voice into symbolic recording, while the technical siren generates tones by numbered holes representing numerical frequencies as the reverse of the time domain of wave forms.

- epistmological rupture between "analogue" and "digital" electronics, incorporated in a literally transitional device: the analog-to-digital converter ("Sampling"). A voice transposer who does not simply want to produce the Mickey-mouse effect (by speeding up tape recordings of a voice) must contain a mirco-processor (which in Kittler's case had been programmed in ASSEMBLER).

- "The phonograph is [...] incapable of achieving real-time frequency shifts. For this we need rock bands with harmonizers that are able to reverse - with considerable electronic effort - the inevitable speed changes, at least to deceivable human ears. Only then then [...] women can be men and men can be woman again."[50]

- It is not from within cultural poetics that a non-mythologic "real" of the Siren motive can be revealed; aural analysis in its media-archaeological sense does not retroactively reveal a truth in the Homeric theme, but reveals evidence which is *a poriori* different from discursive expression, beyond traditional philological methods: "The white noise signal recorded between the two smaller islets showed higher amplitudes in the 1000-5000 Hz frequency range than the same signal recorded just in front of the islands. [...] This result can be seen clearly in the lower harmonics where the main energy of sound is located. The changes in loudness were distinctly perceived even to the naked ear. [...] the specific geographical constellation of the island acts as an acoustic amplifier [...]."[51]

- Sirens like Muses remain oral poetry, while entities of real experience provided even non-human wisdom from within and through the audible domain. "[a]s our experiments show, there is only a sharp line between real acoustic

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48 See W. E., Der Appell der Medien. Wissensgeschichte und ihr Anderes, in: Ana Ofak / Philipp von Hilgers (eds.), Rekursionen. Faltungen des Wissens, Munich (Fink) 2010, 177-97 (182)

49 Walter Benjamin, Illuminations. Essays and Reflection, ed. by Hannah Arendt, New York (Schocken) 1968, 237

50 Friedrich Kittler, Gramophone - Film - Typewriter, Stanford (Stanford UP) 1999, as quoted here in: Jonathan Sterne (ed.), Sound studies reader, London (routledge) 2012, 243

51 Karl-Heinz Frommolt / Martin Carlé, The Song of the Sirens (typescript)

phenomena and acoustic hallucinations at the Sirens' Island", while in early Greek thinking Sirens incorporate acoustical features of [...] musicological relevance."[52]

[Media archaeology focuses on the acoustic "evidence" or (in order to avoid oculocentrism) rather sonicity which arises from such archeo-acoustic research: "[...] intervals given together by two Sirens at Li Galli can only be differentiated as being 'accords', that means having two separate sources, if their overtone structures do not merge."[53] Enharmonic tuning in Ancient Greece has been developed from an early diaphony for which next to the double-*aulos* the *casus dualis* in the song of the two sirens holds. This could therefore have been acoustically motivated which leads media archaeology to a musicological hypothesis of an early Greek diaphony based on enharmony. Methodically, this indicates that from the closest techno-archaeological analysis new cultural insights arise once coupled with aesthetic knowledge. For further *acoustic reasoning* on the site, there is still latent sonicity waiting to be unfolded media-archaeologically

- to arrive at "non-Pythagorean sound"[54], it required a media-technical archaeology of listening, by focusing on the non-human means of observation, measuring and recording as active agencies of knowledge on hearing; the loudspeaker as sonifyer played a crucial role. It was with the invention of the electric telephone and the vacuum tube-based, thus amplifying loudspeaker that prevously non-acoustic phenomena (such as small electric currents in human nerves) could be sonified in physiology and other branches of science. The fact that in recent years so-called "cultures of listening" and techniques of sonification have emerged within cultural studies is itself such a media-technological effect. In previous centuries, sonic articulation has belonged to the most *transitive* cultural phenomena; hidden acoustic knowledge has not eben been existent to cultural consciousness though it was co-present in any articulation

- *listening* to modernity[55] and to past sono-spheres; the World Soundscape Project of Raymond Murray Schaffer and other projects to "archivize" soundscapes

- historicist re-enactment of music from the past: When instruments from the past are not just objects in historical museum but re-used to perform ancient music, they change their essence from historical to processual hardware, thus: truly becoming media (again); they transform from historical to media-archaeological objects; embody the physics of past soundscapes

- trying to re-access transient articulations, past modes of listening - which vary

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52 Frommolt / Carlé, op. cit.

53 Frommolt / Carlé, op. cit. See as well Martin Carlé, Enharmonische Archäologie der griechischen Musiknotation, in: W. E. / Friedrich Kittler (eds.), Die Geburt des Vokalalphabets aus dem Geist der Poesie, Munich (Fink) 2006, 281-297

54 A term coined by Johannes Kroier, Berlin

55 See the Sawyer Seminar lecture series *Hearing Modernity* at Harvard University (Dept. of Musicology), winter term 2013/2014

with cultural history - can not only be reconstructed by written descriptions; both past and present ears can rather be coupled to the same media mechanisms - be it the Pythagorean monochord, be it the Edison phonograph; acoustic or musical experience which depends on electronicdevices is appropriately calld *sonics*. Such technically embedded logics, exactly because it is non-human itself, allows for a non-historical immediacy, a co-original (German: *gleichursprüngliche*) situation. The media archaeologic assumption is that the human auditory apparatus is forced to obey laws imposed by the media apparatus itself; historicity therefore is deferred by and to such technologies

(Pre-)Edison sound(s) can not be historiographized at all, since they do not exist as historical but diagrammatic records[56]; best method to understand a medium is by re-engineering it and by its functional (re-)enactment: on "reenactment" as historical method: R. G. Collingwood, The Idea of History [*1946], rev. ed. Oxford et al. (Oxford University Press) 1993. When procedure which Pythgoras experimented with the monochord in the 6th century B.C. re-enact today, that is: when pulling such a string, actual re-enacting the techno-physical insight of the relation between integer numbers and harmonic musical intervalls which once led Greek natural philosophers to muse about the mathematical beauty of cosmic order in general (including the experience and fear of deviation of this aesthetic ideology resulting in the "Pythagorean *komma*", that is: irrational number relations); in terms of cultural discourse, certainly not same situation like Pythagoras; "historical" circumstances, even the ways of listening and the psycho-physical tuning of our ears, is different. Still, the monochord is a time-machine in a different sense: It grants participation at the original discovery of musicolgical knowledge, since - the techno-original experience is repeatable; the re-enacted experiment allows for com/munication across the cultural-historical gap by providing a storage-channel; reverberating chord is an operative sonic media diagram. Charles Sanders Peirce described diagrammatic reasoning as such: "[...] similar experiments performed upon any diagram constructed to the same precept would have the same results [...]."[57] Once human senses are coupled with a technological (especially sonic) setting, man is within its autopoietic temporal field, a chrono-regime of its own dynamics (or mathematics, when data are registered digitally). Such couplings create moments of literal ex-ception: Man is taken out of the man-made cultural world (which is Giambattista Vico's definition of "history") and confronts naked physics and / or pure logical reasoning.

- Barbara Engh, referring to Theodor W. Adorno's writings on phonographic recording, accentuates the extent to which the Sirenic singing is not human;

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56 See Axel Volmar, Gespitzte Ohren. Akroamatische Dispositive und musisches Wissen als Grundlage für eine Geschichte epistemogener Klänge, in: MusikTheorie. Zeitschrift für Musikwissenschaft, vol. 22 (2007), no 4 (thematic issue: Perì mousikès epistéme. Zur Aktualität des antiken griechischen Wissens von der Musik, edited by Sebastian Klotz), 365-376 (366)

57 Charles S. Peirce, The New Elements of Mathematics, vol. IV: Mathematical Philosophy, The Hague / Paris (Mouton) / Atlantic Highlands, N. J. (Humanities Press) 1976, 48

"wherein the more perfectly the machine is able to represent the human, the more thoroughly is the human removed [...]."[58] Therein resides the techno-traumatic element of the voice itself as "the site at which, in the distinction between the cry and the song, the human and the inhuman are differentiated in a state of perennial irresolution."[59]

Time Shards (in the media-active test)

- video-interview of a fictitious archaeologist, with sonagrams under the title *Le Vase* (Internet search term: "ancient sound / archaeology")[60]

- reverse phonography / acoustic media-archaeology: SF; orig. 1979; *online* 2000: Gregory Benford, *Time Shards*: "As workers at the Smithsonian prepare a time capsule to be buried in 2000 AD, a scientist tries to resurrect voices from 1000 AD" (Robert J. Sawyer); listen to the voices of people from a thousand years ago by rading grooves on pottery = www.fictionwise.com/ebooks/eBook243.htm

- convert the grooves in ancient pottery (Roman vases from our Archaeology Department) by gramophonic sampling into analog and digital signals, by software-based signal-to-noise analysis separating any trace of phonetic articulation from the scratch of the material (signal-to-noise ratio); Wolfgang Heckl: apply nano-physical research tools; double sense of German "Tonspur" (record groove)

Siren songs

- media-archaeological dis-ambiguation of "the ambiguity surrounding the Sirens´ song"[61], close to Maurice Blanchot´s interpretation of the "superhuman", not even anthropomophic <Doherty 1995: 136>; Turing test ("Imitaiton game")

- contrary to Walter Benjamin's anecdote of the dwarf within the mechanical chess-player, media archaeology refers to the inhuman mechanisms within the human itself; vocal automata no more represent an allegoric discourse about the instrumentalization of the human body, reveal the automativity within the animal itself

- reverse phonography is acoustic media-archaeology; experimentally realistic by the options of quantum microscopic reading of atomic surfaces; Gregory

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58 Barbara Engh, Adorno and the Sirens: tele-phonographic bodies, in: Leslie C. Dunn / Nancy A. Jones (eds.), Embodied voices. Representing female vocality in western culture, Cambridge et al. (Cambridge University Press) 1994, 120-135 (126). See as well Thomas Y. Levin,For the Record: Adorno on Music in the Age of its Technological Reproducibility, in: October 55 (Winter 1990), 23-47

59 Engh 1994: 134

60 www.zalea.org/article.php3?id_article=496

61 Lillian Eileen Doherty, Siren Songs. Gender, Audiences, and Narrators in the Odyssey, Ann Arbor (University of Michigan Press) 1995, 61

Benford, *Time Shards*, orig. 1979; *online* 2000: FictionWise eBooks. "As workers at the Smithsonian prepare a time capsule to be buried in 2000 AD, a scientist tries to resurrect voices from 1000 AD" (Robert J. Sawyer) by reading grooves on pottery = www.fictionwise.com/ebooks/eBook243.htm

- Wolfgang Heckl, "fossil voices"; sound of the past (still) in the air, if it is understood in its physical nature which is (calculable) vibrations, as expressed by Charles Babbage in his *Ninth Bridgewater Treatise*: "The track of every canoe, of every vessel which has yet disturbed the surface of the ocean, whether impelled by manuel force or elemental power, remains for ever registered in the future movement of all succeeding particles which may occupy its place. <...> and these again once moved, communicate motion to others in endless succession."[62]

- discrete pulses, acoustic signal processing, resulting in an instrumental siren, developed by Charles Cargniard La Tour in 1819; improved by Hermann v. Helmholtz, linking sound production to the mathematics of Fourier series

- Edgard Varèse, in his piece *Ionisation*, performs "corporification de l'intelligence qui est dans le sons" with technical siren

- with optical film soundtrack end 1920s, sound photoelectrically recorded on a narrow track beside the images, "and the fact that it is visible means that is can even be monitored and analysed. Most of the photoelectric organs and organ-like instruments from the late 1920s and the 1930s were based on the mechanism of a rotating disc that interrupted the passage of a beam of light between its source and a photocell <...>, thus avoiding the wear and tear of direct contact with the surface of the recording. Many of these systems used a principle derived from that of the siren [...] a rotating opaque disc in which holes or slits had been cut" = Davies 1994: 6; Abb. = 7; synthetic sound; a technical "vocoder"

- *Resonance of Siren Songs*; how can an acoustic event which is supposed to have happened before the age of gramophonic recording be verified? test and reconstruct such acoustic events by media-archaeological means

- John Cage's experience in the *anechoic* chamber

Locating the Sirens

- counter-audio: impulses from Helmholtz Double-siren tone generator; Youtube-video xxx

- Karl-Heinz Frommolt / Martin Carlé, The song of the sirens, in: Nordic Journal of Aesthetics, 2014

Since antiquity, the Li Galli islands at the Amalfi coast (Italy) are believed to be

62 The Works of Charles Babbage, ed. Martin Campbell-Kelly, vol. 9: The Ninth Bridgewater Treatise. A Fragment, 2nd ed. 1838, London (Pickering) 1989, Kapitel IX, 37

the place were Odysseus during his journey heard the famous voices of the Sirens; sound propagation experiments at the original historical place, broadcasting both synthetic signals (sine tones, white noise) and natural voices (vocalizations of Monk seals, voices of two female singers) via loudspeaker. The Signals were then recorded along an thought line along which Odysseus could approach the Siren Island. The acoustic analysis of the recordings revealed strong evidence for an acoustic effect which could explain the nature of the mythic song of the Sirens. The specific position of the three Islands yielded in an deformation of the acoustic signal in form of amplification and changes in the timbre. [...] However it remains still under question who was the emitter of the song.

- explicitely *two* sirens, a mirror-image of the double-flute as muscial instrument with disharmonic joints

- Aaccording to Homer, Ulysses heard the Siren songs just because a divine power, a *daimon*, camled down the sea around the Siren islands

- hypersonic spotlights and sonic hallucinations appear in the *Dictionary of Non Lethal Weapons* edited by John B. Alexander: "Voice Synthesis / Morphing Device to synthesize the voice or images of a known figure, to deceive, produce false orders, or gain acccess"; psycho-acoustically, "no one can escape from the inner voice, the acoustic hallucination has power over the hallucinating" (Arndt>); ultrasound spotlights target messages and silently adress people; sound packet, whatever it contains, is only heard in the head of the target person, the skull bones play the role of a resonator, which changes the hight frequency waves back into audible sound - "demodulation, just like with radio waves" = Olaf Arndt, Wer nicht hören will muss fühlen = Voices of the Mind III, in: Babel No 4 (May 2004), 32-41 (38)

- In 1925, Sigmund Freud's *A Note upon the `Mystic Writing Pad´* in which he compared human memory apparatus with a common children´s toy. One makes incisions onto a way tablet, over which has been stretched a thin sheet of cellophane; cp. acoustic membrane/ microphone. When one pulls up the cellophane, the marks on the surcace seem to disappear. "Yet the traces of the incisions remain in the wax, almost unreadable, yet present all the same" = paraphrased in: Arnold Dreyblatt, Inscriptions, 2005 Frankfurt /M., 32. Original: "If we lift the entire covering sheet <...> off the wax slab, the writing vanishes and <...> does not re-appear again. The surface of the Mystic Pad is clear of writing and once more capable of reveiving impreessions. But it is easy to discover that the permanent trace of what was written is retained upon the wax slab itself and is legible in suitable lights. But htis is precisely the way in which <...> our mental apparatus performs its perceptual function." = Sigmund Freud, A Note upon the `Mystic Writin gPad´, in: International Journal Psycho-Analysis, 21 (4), 469-74, trans. James Strachey 1950

- Heckl's design for archaeo-acoustic experiment: re-play of grooves from ancient pottery, and Gergory Benford's Science Fiction novel *Time Shards*

This idea is not media-archaeologically far-fetched, but the missing link is Platon in his dialogue *Theaetet* (§ 191), where Platon lets Socrates say: "Please assume <...> that there is in our souls a block of wax <...>. this is the gift of

Memory, the mother of the Muses, and <...> whenever we wish to remember anything we see or hear <!> or think of in our own minds, we hold this wax under the perceptions and thoughts and imprint them upon it, just as we make impressions from seal reings; <...> but whatever is rubbe dout or cannot be imprinted we forget and do not know."

- in the age of Turing tests, uncertainty whether the sounds we are confronted with are organic or technologically produced. The constellation, the *dispositif* (to take a term from the French *apparatus* media theory of Baudry and others) of listening to Siren songs is metonymic of a further state of uncertainty: is such a sound meant to be communicative, is it directional (a signal) or rather a pure utterance (acoustic impulse)? is it acoustic, sonic or musical? These are the three media-archaeological layers for analytic differentiation of sound as event (with the acoustic denotating the physical event, with the sonic being already technoculturally prefigured and the musical being semantically charged

- sound = the channel of the real. It leaves traces in our bodily memory likegrammophone grooves. Wax cylinder is an essential recording medium, because - according to Descartes and Fritz Heider - is provides a loose coupling of elements, on which a tight coupling ("form") can be impressed - in/formation.

TECHNOLOGICAL VOICING OF TRAUMATIC MEMORY

Technological de-humanizing of oral testimony

- sonic tatoos: Skin Motion is a mobile app and platform for playing back sound wave tattoos; http://wtop.com/tech/2017/05/listen-new-app-plays-audio-tattoos; accessed 16 May, 2017

- once explicit human testimony based on phonographic recording, electronic (im)materialities and algorithmic processing, it is implicitly co-experienced by the receiver as irritating tempor(e)alities in a sub-traumatic sense: an ongoing, but rather subliminal irritation, persistent exactly because it is not experienced consciously

- digitally mediated oral testimony not simply a modification of "mediated memory" but a radical gap - both in epistemological terms and in the phenomenology of temporal experience; de-humanization of "digital testimony" both a tragedy and a productive chance for different experimentation (and experience) of cultural memory and a re-definition of the human in the neo-cybernetic sense

- co-induction of voice testimony by technolgy itself

- In times of digital sound recording and processing, no more "noise" (traumatic intrusions of the real) in listening to phonographed voices from the past; silence of the noise of the apparatus as "historical" testimony is even more sub-traumatically irritating to the senses (case audio CD)

"Bad recording" of beautiful voices

- direct recording of Callas' voice from 1954 concert *Lucia di Lamermore* in Scala, Milano; for radio broadcasting nowadays considered almost unplayable as so-called "bad recording", normally accompanied by an excuse by the classic radio Dj; "Callas"; *as if* perceived by short wave radio: Tenor, in Gaetano Donizettis *Lucia di Lammamoor*, recording Scala Milano, 1954 under Karajan. In the midst a radio signal interferes with the concert recording itself.

- Callas' voice rivalling with microphone distortions, demanding for close listening with media-archaeological ears; radio wave interference with cultural soundings. When broadcast in German Kulturradio, the speaker in advance apologized for "bad" recording; positively defend the medium expressing itself, documenting; opera recordings from the past in 20th century is possible only by means of technologies; critically (or ironically) allow them to be co-enunciative

Let the medium speak: ghost talk

- control noise by mis-interpreting it as communication; Stephen Greenblatt wanted to communicate with the dead beyond the textual archive acoustically, letting sound pass through the open mouth, the empty void of the (death) mask in Greek and Roman theatre (*personare*) or - closer to our concern - in front of a sequence of ancestor masks in a Roman aristocratic house: "I began with the desire to speak with the dead. <...> If I never believed that the dead could hear me, and if I knew that the dead could not speak, I was nevertheless certain that I could recreate a conversation with them" = Stephen Greenblatt, Shakespearean Negotiations. The Circulation of Social Energy in Renaissance England, Berkeley 1988, 1. In the electronic media age, though, the medium to speak with the dead is not texts any more, not literature, but the radio

- tuning of a radio in search not only for channels but for the inbetween of channels (the noise intererential spaces) functions only with analog radio sets, with an „elastic“ scale

- against "noiseless" digital aesthetifs, electronic analog media still know what noise is

- any figurative image is emphatically negentropic

- radio jamming interpreted by the human ear (which immediately, as cognition, strives to makes sense or at least message or at least melody out of noisy signals) as voice from beyond (noise): „No Morse-code, nor a radio amateur“

ARCHIVING AUDIO-PRESENCE

Techno-traumatic irritations

- traumatic momentum from micro-shocks technologically induced in human media perception; whether the audio-visual "witness", once digitized, on most essential technological level looses its indexicality; does Shannon / Nyquist sampling theorem for analog-to-digital signal conversion actually guarantee that the indexicality of the signal remains intact? "Part of the implicit ideology of digital audio is that with increasing sample rates and bit depths we come closer and closer to representing the real, but the 'real' seems to recede from each attempt to grasp it"[63]; central aspect of "Digital Humanities" addressed thereby

Whereas the "traumatic" moment in analog media testimony resulted from the phonographic presence of the voice in re-play, the photographic *punctum* as identified by Roland Barthes (see Markos Hadjioannou, From Light to Byte. Toward an Ethics of Digital Cinema, Minneapolis: Univ. of Minnesota Press, 2012, esp. 50ff on Alain Resnais' documentary film *Night & Fog* from 1955) and the indexial trace of light in electronic video (see Laura U. Marks, Touch. Sensuous Theory and Multisensory Media, Minneapolis: Univ. of Minnesota Pr., 2002; Mary Ann Doana, The Emergence of Cinematic Time, Cambridge, Mass. / London: Harvard UP 2002), with the digitization of such technical records their status is transformed or even "transsubstantiated" (to borrow a term from Christian liturgy) in technological, historical (source) and ethical (Holocaust memory) ways.

- "algorhythmicized testimony" (proposal Amit Pinchevski); a looped timing of the digital Yale Holocaust Archive voices. "Data *processing* is the name given to the manipulation of data to produce a more useful form, which we shall call *information*. <...> The sequene of operations required to perform a specific task is known as an *algorithm*" = J. D. Richards / N. S. Ryan (eds.), Data Processing in Archaeology, Cambridge U. P. 1985, 1 f.

Archiving Presence: From Analog to Digital

- “Archiving presence”, a deliberate oxymoron; implies both storing and re-storing, recording and regenerating presence-effects; Edison’s 1877 invention of the phonograph enabled the acoustic recording of the dis-embodied voice; induced a cultural shock whose impact still resonates nowadays; dissonance between cognitive knowledge (the historicity of the recording, the knowledge that it is already in the past) and its neuro-physiological effect (the perception of the voice as pure presence, always in the present) = Mladen Dolar, A Voice and Nothing More, Cambridge, Mass. / London (MIT Press) 2006 [= Eine Theorie der Stimme, Frankfurt/M. (Suhrkamp) 2007]; there is no "past" in sonic articulation

- Amit Pinchevski / Tamar Liebes, Severed Voices: Radio and the Mediation of Trauma in the Eichmann Trial , in: Public Culture 22:2 (2010), 265-291, note 2: Orson Welles’s radio dramatization of H. G. Wells' *War of the Worlds*, aired in October 1938, caused widespread panic among audiences who thought Martians were actually about to invade New Jersey: by the (simulated) collapse

63 Peter Price, Resonance. Philosophy for Sonic Art, New York / Dresden (Atropos Press) 2011, 85

of the broadcasting network itself; Dayan, Daniel, and Elihu Katz. 1992. Media events: The live broadcasting of history. Cambridge, Mass.: Harvard University Press

- Anthony Enns, Voices of the dead: Transmission / translation / transgression, in: Culture, Theory and Critique vol. 46 (2005), 11 – 27

Techno-Trauma: From Analog to Digital

- media-archaeological shift of attention to a more fundamental level: traumatic affects as immediate functions of the technological pre-conditions themselves. When coupled with human perception, electronic and algorithmic media operations result in specific irritations of the human sense of time.

- the phonographic affect; un/like photographic *punctum* short-circuiting historical distance described as an affective temporal indexicality in direct relation to photo-sensitive chemicals; Roland Barthes, La chambre claire. Notes sur la photographie, Paris (Gallimard / Seuil) 1980 [Camera Lucida. Reflections on Photography, trans. Richard Howard, New York (Hill & Wang) 1981

- cultural shock induced by the first recordings and re-playing of voices by the Edison phonograph is yet to be digested in occidental cultural epistemology and logocentrism. The modelling of the human unconsciousness according to binary machine logics by Jacques Lacan has finally undermined the self-understanding of a privileged human subjectivity - an ongoing irritation of presence

- a special class of traumatic temporality springs from the technological re-conditioning of temporal experience itself

- oral and sonic signal recording, signal transmission, signal processing and signal replaying technologies as a privileged site for analyzing practices of archiving presence and re-presencing the past as it undergoes analog-to-digital conversion

- unarchivable presence as definition of "traumatic" memory

- in a theatre play from 1924 *Katalaunische Schlacht* (by Arnolt Bronnen) a grammophone acts itself which haunts the actors by a spectral (in all senses) repeatable voice - literally "nachgetragen" (*nachträglich*) <Lethen 2014: 205>

- Traumatic voice memory is not only belated but ante-cedant, already inherent in the affective shock (the "Nipper effect", figuring as the visual icon on HMV records), induced by the experience of the technologically dis-embodied voice

- Max Bense: cybernetic machines exhaust the smallest interval

- "out-of-sync" (the missing half-second); Herta Sturm: empty time interval vs. Massumi: full interval

- Speech Synthesis and the Uncanny (Nikita Braguinski); Freud, *Das*

Unheimliche, referring to Ernst Jentsch: doubts about wax figures / automata: (no) consciousness; boundary between human / inhuman is blurred in artificial dolls (Edison records inside); technical *embodiment* of the voice; see Blanchot, "Sirens"; resulting in the uncanny feeling about one's own partial functioning as machine

- Norwegean composer Christian Blom creates uncanny encounters of mechanical acoustics and electr(on)ic current, such as al Khowarizmis Mekaniske Orkester = algorithmic orchestra (with the sequence of operations computationally / stochastically programmed?); Shintaro Miyazaki's research on the "algorhythmic". True media-archaeological sonicity, and recurrence of the sirens: The Singer; https://vimeo.com/user47473836

"Prayers of a Phonographic Doll" (Anderson Blanton)

- Anderson Blanton; question of presence, especially in relation to technicity / materiality of phonographic prayer; http://forums.ssrc.org/ndsp/2014/01/29/prayers-of-a-phonographic-doll

- the uncanny of death (the ultimate sublime sensation of the "real" according to Lacan) is thus dis-locafted from metaphysics to the machine

- Walter Rathenau's essay on "Resurrection Co."; telephonic connection of the grave to the living

- with the prayer machine, the traumatic (here: death as subject of prayer) is dislocated from the symbolic (reading) into the real of the machine itself (the "speaking doll"), thus: really techno-traumatic (in fact, does this not challenge "the social" as agency?). This is related to the issue of the uncanniness of "Sirenic voices"

- "The doll's mechanical recitation marks an important technological shift in the practice of teaching children to pray. The child's private devitions are no longer founded upon a particular [...] practice of phonetic alphabetization and the concomitant 'hearing' or the silently read biblical passage as a divine coice withinthe mind." In the case of the speaking dolls, the child does not learn the alphabet from the mother's mouth any more but from the machine; text-to-speech program

VOICES AS PHONOGRAPHIC EVENT

Phonographic recursion of the phonetic alphabet

- 1878 Edison described in a patent one of the possible uses of the phonograph as speech generator, "to teach the relationship between each letter of the alphabet and its sound: a set of typrewriter keys, each labelled with a single letter, activated the playback of individual sections of a long cylinder that

contained the spoken forms of those particular letters"[64] - a media-archaeological (rather than "historical") recursion of a cultural technique, since not immediately reflected in cultural terms - when the invention(s) of the discrete alphabet (as opposed to ideographic writing systems) cut down the human language into smallest elements which are meaningless in themselves, from house (*beta*) to "B", so to say. At this moment the machines take over, since only machines can perform symbolic operations without any semantic referentiality (which hinders effective data processing), purely syntactically; signal processing rather than semiotics, mediatic operativity rather then cultural "performance"

Historical *versus* media-archaeological reconstruction of sonospheres

- novel from 1880, *L'Eve Future*, Vielliers de l'Isle-Adam: before the phonograph any sonic expression (be it speech or music) had to be symbolically transformed into music notation in order to survive in time; with technical recording sound immediately becomes inscribed into a non-historical, non-human, signal-based material medium which literally has to get in motion (like the turning disc or the hard drive) in order to get re-presenced. By electroacoustic recording, "the concept of a linear flow of time becomes an anachronism"[65] itself. The formerly "historic" relation between presence and past is replaced by resonance; *sonicity* refers to the implicit tempor(e)ality which is connected with vibrating, oscillatory and frequential articulation; Steve Goodman, The Ontology of Vibrational Force, in: same author, Sonic Warfare. Sound, Affect and the Ecology of Fear, Cambridge, Mass. (MIT Press) 2009, 81-84. If the signal being transmitted is *continuous* (“as in oral speech”) rather than being formed of *discrete* symbols (“as in written speech”), this fact affects the message (Weaver, 1963: 8)

- Marcel Proust makes the reader think *of* bygone times, but when hearing Kirsten Flagstad as Isolde, with the Royal Opera House Orchestra under the leadership of Sir Thomas Beecham, her voice *is* concretely present to the perceptive mind. "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: xxx

- Greek vocalization of the Phenician alphabet symbolically emulates, by recording (grammo-phonically), the musical character of oral poetry (notably the epics of Homer); even the phonograph reaches its limits when it comes to record the purely physical noise: "Ansi, j`eusse blâmé, par exemple, le Phonographe de son impuissance à reproduire, en tant que *bruits*, le bruit ... de la Chute de l'Empire romain ... les bruits qui courent ... les silences *éloquents* ..."[66]

- signal semantics in Steve Reich's minimalist composition *Different Trains*: acoustic memories of former train journeys, indexical *train sounds* combined

64 Hugh Davies, A History of Sampling, in: Feedback Papers 40 (Juli 1994), 2-15 (4)
65 Barry Truax, Acoustic Communication, Norwood, N. J. (Ablex) 1984, 115
66 Edition Lausanne (L'Age d'Homme) 1979, 36

with human testimonies (*voices of train porters*)

Indirect transmission of sound (the vocal alphabet)

- thesis of Barry Powell: ancient Greek modification of the Phoenician syllabic and consonant-based alphabet by adding symbols representing spoken vowels stemmed from the explicit "lyric" desire to record and thus transfer the musicality of oral poetry, notably Homer's epics *The Iliad* and *The Odyssee*, in writing - and early form of phono-graphy[67]

- Aristotelean correlation of time-number-movement; the over-countable in-between (*to metaxy*); phonographic signal recording in privileged alliance with the physically "real" acoustic articulation = Friedrich Kittler, Die Welt des Symbolischen - eine Welt der Maschine, in: ders., Draculas Vermächtnis. Technische Schriften, Leipzig (Reclam) 1991, 58-80 (68), unter Bezug auf: Jacques Lacan, 1973-80, in: Schriften, hg. v. Norbert Haas, Olten-Freiburg/Br., Bd. I, 24

- evidence of ancient Greek musical articulation, according to xxx West, actually preserved in the metric verses and musical notations which embody the temporal measures, the actually articulated rhythms of poetic articulation[68]

- "Chronotechnics" in adaption of Aristoxenos' term *chronoi* as smallest units ot time in rhythm: long, short, intervals; extend / re-actualize to digital computational cycling units; See introduction Lionel Pearson, to: Aristoxenus, Elementa Rhythmica. The Fragment of Book II and the Additional Evidence for Aristoxenian Rhythmic Theory, Oxford (Clarendon Press) 1990, xxxiv. Pearson ergänzt: "One of the difficulties in reading Aristoxenus is to distinguish the special or technical use of a word from its general meaning. Greeks of his time were devising their own technical and scientific terminology. They could not borrow unfamiliar words from Egyptian or Babylonian as we borrow them from Greek and Latin for this purpose" <ebd., Fußnote 20>.

- close relation between the rhythms (time-measure) in the prosodic articulation of syllable-based Indoeuropean languages, early notation of vocal music, and dance. From this interrelation, the archaeologist of cultural articulation indirectly deduces information on the very nature of time-based movement from poetic verse: Indication of tempo, e. g., "can be drawn from the relation of music to movement. We do not know how to match notes to dance-steps"[69]

- audio-visual recording registers artistic expression (music, dance) "wie sie auch mit noch so elaborierten schriftlichen Methoden nicht annähernd möglich ist"[70]. At that point, recording media change from passive to active archival

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67 See Barry Powell, Homer and the origin of writing, xxx 1990; W. E. / Friedrich Kittler (eds.), Die Geburt des Vokalalphabets aus dem Geist der Poesie, Munich (Fink) 2006

68 xxx West. >Ancient Greek Music Theory>, xxx

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

70 Dietrich Schüller, Von der Bewahrung des Trägers zur Bewahrung des Inhalts, in: Medium Nr. 4 (1994), Themenheft: *Archive - Medien als Gedächtnis*, 28-32 (28)

functions, from pure storage to genuine *arché*; media conditions of the possibility of auditory reconstructions

Sound archaeology

- sampling rate of 48 kHz with quantization of 16 bit linear storage

- listen to human voices which exterminated hundred years ago, by applying laser reading of the wax cylinders which do not destroy its source in the act of re-play; play-back in exactly the same quality as the Indian natives could in 1907. An example of the opto-eletronic archaeology of sound can be appropriately experienced right in the World Wide Web.[71] What do we hear: Message (the formerly recorded songs) or noise (the scratch; recording primarily memorizes the noise of the wax cylinder itself - which is not cultural-historical, but cultural-technological, a different kind of impression of the real. Media archaeology opens our ears to listen to this as well, not to filter this out against the "cocktail party effect" of hermeneutics

- by media-archaeological operation of opto-digitally reading of inscribed traces, otherwise unaccessible sound recording becomes audible again. Synesthetically, *see* a spectrographic image of sound memory; spectrogram of a reconstructed recording of Wedda chants in Ceylon 1907 on the SpuBiTo web page; micro-physical *close reading* of sound, where the materiality of the recording medium itself becomes poetical[72], dissolves any semantically meaningful archival unit into discrete blocks of signals. Instead of musicological hermeneutics, the media-archaeological gaze is required here - a reminder of light-based sound inscription in early film

- noise, the scratch of the wax cylinder is the pure message of the medium; inbetween, the human voice is literally incorporated. But what has been continuously been preserved by analogue recording technologies, becomes quantified in the transfer to digital recording (CDs). When sampling a continuous wave with an analog-to-digital converter, sampling rate controls how many samples are taken per second; the sampling precision controls how many different gradations (quantization levels) are possible when taking the sample

Technologies of sonic tradition: a signal-to-noise ratio

- what articulates 'it'self in human / nonhuman communication in any transmission channel is noise, against which Shannon developed a primarily "mathematical theory of communication" *alias* digital media

- extend Shannon's theorem to transmission in time as well, that is: tradition. In

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71 http://www.gfai.de/projekte/spubito/index.htm; now expired: see archive.org "Wayback Machine"

72 See Karl Sierek, Die weiße Leinwand, in: ders., Aus der Bildhaft. Filmanalyse als Kinoästhetik, Wien (Sonderzahl) 1993, 115-130 (122), referring to: Umberto Eco, Semiotik, 263 f.

such noise articulates itself what baroque allegories showed as the nagging „tooth of time“ - the articulation of physical entropy, the manifestation of the temporal arrow; according to the Second Law of Thermodynamics each system tends, over time, to increasing dis-order. Noise, here, is a signal of entropy. Against this noise of the real culture (especially techno-logical, that is: „digital“ culture) poses a negentropic insistance, a negation of decay and passing (away)

- digital copies of digital records can indeed be produced almost without loss of data (except the quantization noise). Music on Compact Disc or a digitale video can be reproduced frequently with stable quality which was utopean in recent times of analoge recording on magnetic tape. The secret of this temporal unvulnerability is that it is just (physical representations of) numbers which are written on the Compact Disc; even after a thousand copies thus a zero stays zero and one remains one[73]

- natural sound = evasive, liquid, in itself unrecordable beyond the bodily range, but technical media (different from alphabetic phonetic writing which "freezes" the human voice into a range of a very limited symbolic code) are able to de-freeze recorded voices in almost all frequencies (that is, the Lacanean "real" of the voice) by re-play. After two millennia of the phonetic alphabet there is a new kind of cultural technology as sound recording.

Berlin Lautarchiv

- target of sonic analytics not individual speech in terms of meaningful content, but first of all subsemantic insights which can be derived from the very materiality of sono-cultural articulation: *phoné* (German "Laut").[74] Very literally, the phonographic collection of early voice recordings (Lautarchiv) based at Humboldt University, Berlin is an ideal subject for such a sonic archaeology. The Lautarchiv encompasses three groups: a) Famous voices (which for political reasons were partly neutralized or even destroyed after 1945); b) truly archival recordings of local speech dialects, based on a set of artificial word sequences in order to achieve formal comparability (so-called Wenker-sentences) with the speed of the recording beeing controlled by a supplementary oscillographic time code, and c) recordings for musical ethnology (mostly Africans and Indians from the French and British Army in the World War One *Halbmond* prisoner camp at Wünsdorf south of Berlin).[75]

- almost complete list of the both phonographically and symbolically registered recordings online: http://www.sammlungen.hu-berlin.de/sammlungen/78

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73 Rudolf Taschner, Der Zahlen gigantische Schatten. Mathematik im Zeichen der Zeit, Wiesbaden (Vieweg) 3. Aufl. 2005, Anm. 77

74 For several socio-linguistic and computer-based analyses in the techno-culturally variant coding of human voice frequencies see Zakharine / Meise (eds.) 2013

75 See Britta Lange, Ein Archiv von Stimmen. Kriegsgefangene unter ethnografischer Beobachtung, in: Nikolaus Wegmann / Harun Maye / Cornelius Reiber (eds.), Original / Ton. Zur Mediengeschichte des O-Tons, Konstanz (Universitätsverlag) 2006, 317-341 (esp. 335 f.)

- phonological target inscribed into the Lautarchiv by its promotor Wilhelm Doegen from the beginning - notwithstanding the circumstances of its coming-into-being with recordings in a prisoner camp. While cultural analysis concentrates on this ambivalent historical and discursive context, with a different epistemological vantage point media archaeology lends its ears to knowledge which can be derived from the actual media articulation contained in the technical archive itself

- phonographic recordings since April 1920 integrated as Department of Phonetics (*Lautabteilung*) into the Prussian State Library in Berlin to be reproduced on schellack discs *and* as transcription for educational distribution[76]; original relation between spoken orality and its *grama*-phonic derivative (the phonetic alphabet) reversed again by the intrusion of real audio signals into the symbolical order of the librarians' Gutenberg world of letters, resulting in a kind of animated phonetic library: "Die toten Buchstaben und Büchertexte werden hier durch die Ergänzung der Lautplatte lebendig und verkörpern eine wirkliche Lautbücherei" = Wilhelm Doegen, Die Lautabteilung, in: Fünfzehn Jahre Königliche und Staatsbibliothek 1921, Berlin (Preußische Staatsbibliothek) 1921, 253-258 (253)

- architectural front facade of German Library in Leipzig (Deutsche Bücherei), founded in 1913, displays a monumental quote from a Schiller poem: "Körper und Stimme leiht die Schrift dem stummen Gedanken [...]." Printed text as it were start to speak from a gramophonic storage medium which (different from the alphabet) does not discriminate between signal and noise any more: "In Graphie und/oder Phonie des Titelworts `Sprache´ steckt die Lautverbindung 'ach'" = Friedrich A. Kittler, Aufschreibesysteme 1800 / 1900, München (Fink) 1985, 48. *Lautabteilung* consequently accumulates natural and artificial noise („Geräusche natürlicher und künstlicher Art und andere“) such as the sound of tree leaves in the wind. What had started as interlinear auditory hallucinations in romantic literature becomes real in sub-symbolic recording media. The gramophonic recording method for waveforms in the so-called *glyphic system* on wax discs inscribes even sonic warfare into the new cultural memory as *écriture automatique*: "Gewehrfeuer (gun fire) for a theory of sonic explosion, and the sound of air planes ("Fliegergeräusche") = Doegen, op. cit.

- detect minute variances and to eliminate subjective inexactitudes in listening to the recordings of foreign dialects and voices; limits of hand-written phonetic transcription become obvious, leading instead to the application of visual oscillograms and Fourier Analysis of the phonetic wave forms: Alois Brandl, Lebendige Sprache: Beobachtungen an Lautplatten englischer Dialektsätze, mit einem Anhang von Wilhelm Doegen, Zur Lautanalyse aus dem Klangbild des englisches Dialektwortes "man", aus der Lautplatte gewonnen nach dem elektro-oszillographischen Verfahren, in: Sitzungsberichte der Königlich Preußischen Akademie der Wissenschaften, Phil.-hist. Klasse (1928), 72-84

- when explicit listening replaced by technographical measuring of sonicity, gap between cognitive musical understanding and physical recording (the material,

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76 Lautbibliothek: Phonetische Platten und Umschriften, ed. by the Lautabteilung der Preußischen Staatsbibliothek, 1920 onwards

tonally *integrative* engraving of a musical event in the phonographic groove) opens. Just like the point of the gramophone needle can make only one movement at one time, "the illuminated disk of the oscilloscope shows only one line, no matter how many tones are sung into the microphone simultaneously. [...] what the apparatus registers as *one* wave, we *hear* as *multiplicity* of tones - and as a organized multiplicity. [...] mathematical analysis of the shape of the line permits us to deduce the individual waves that are combined in it. Yet [...] our ear accomplishes, effortlessly, continuously, and instantaneously, what costs the skilled mathematician a considerable expenditure of time and energy"[77] - until the Fast Fourier Transform algorithm arrived in real-time digital computing of sound. Even the much more detailled spectral voice analysis which had just been developed in Zuckerkandl's generation subjected the complex dynamics of sonic events once more to the visual knowledge regime since sonagrams, though expressing delicate micro-temporal variations, tend deciphered analog to alphabetic writing.[78] But the tempor(e)ality of sonicity can never be caught in a frozen state but always points beyond the moving still - as has been discussed by Bergson's critique of chronophotography and the cinematographic illusion of "movement".

- ancient phonetic oscillograms today represent the truest media-historiography of that time - while at the same time challenging the historical narrative of their recording context. The real archive of sonic articulation emanating from such recordings is no longer literary stories but numerical analysis - finally resulting in digital sampling of the analogue records which is the transduction of ghostly voices into computability

- on the linguistic field that effective algorithms for recognition first developed - as transformation of physically measurable wave forms of speech signals into electric impulses; operation is based first on electronic transduction and then the transformation of the time-signal to its frequency number = H. Schnelle, Automatische Sprachlauterkennung, in: Kybernetische Maschinen. Prinzip und Anwendugn der automatischen Nachrichtenverarbeitung, Frankfurt/M. (S. Fischer) 1964, 208-219 (211). Thus, sonicity can not be reduced to the dynamics of waveforms, but encompasses mathematical operations and subsequently their machinic computing as well. Once a series of digits can represent waveforms, sound is liberated from its acoustic phenomenology. The statistic tools from corpus-based linguistics have been adopted for music analysis: "While the basic elements and features (or tokens) over which statistics are computed naturally differ between linguistics and musicology, the statistical concepts that allow us to infer regularities within the specific domain are quite similar or nearly identical. Among the chief statistical concepts that can be derived from frequency counts of tokens / features, and that are employed in both fields, are Markov models, entropy and mutual information, association measures, unsupervised clustering techniques, and supervised classifiers such as decision trees."[79]

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77 Victor Zuckerkandl, Sound and Symbol. Music and the External World, New York (Pantheon) 1956, 333f

78 See Ralph K. Potter / George A. Kopp / Harriet C. Green, Visible Speech, New York (Van Nostrand) 1947, and Boris Yankovsky's sound spectrography (as mentioned above).

79 Daniel Müllensiefen / Geraint Wiggins / David Lewis, High-level feature

- focus of sonic analysis in a *Lautarchiv* on the materiality of sound equally valuable in its acoustic and its technological sense. In modern Greek radio broadcasting is called *radiophonia*. Analog to telephony, not speech or music as semantic content is named here, but the phonetic materiality (ancient Greek *phoné* / German *Laut*) of any kind which is transmitted by a neutral medium called radio. In terms of a (media) archaeology of acoustics, the nature of sound is spectral, thus undermining the symbolical (Pythagorean) order of harmonic tonal relations in integer numbers - just as the letters in an alphabet only symbolically relate to the phyiscality of actual speech phonems which are as "differential" (Arseny Avraamov) as the *glissandi* of the Theremin Vox contructed as the first mass-reproduced electronic music instrument by Leon Thermen in revolutionary Soviet Union.[80] With sound production which is subliminal to human perception, sonicity (different from sonority) starts.

"First Sounds" (Patrick Feaster): (Archaeo-)Phonography *avant la lettre*

- the "archival" operation extends from restauration and conservation to re-animation and thus becomes a true media-archaeological operation. In a novel called *Time Shards*, the science fiction author Gregory Benford imagines a research laboratory which reconstructs "fossil voices" out of the grooves of mediaeval pottery

- Patrick Feaster and David Giovannoni succeeded in re-sonifying the preserved phonautographic engravings ("Schallbilder"), beginning with Scott's recording of a sound folk tone of 435 Hz in the year 1859. 150 years later science realized that with optical "reading" of such acoustic signal lines sound can be re-synthesized, and all of the sudden a children's song sounds again: Lèon-Scott, phonautographic recording 8th April 1860, Paris: "Au clair de la lune, Pierrot répondit"; *online* http://www.firstsounds.org/sounds/1860-Scott-Au-Claire-de-la-Lune-09-08.mp3

- what metaphorically looks like the pick-up of sound images by a "virtual, digital gramophone needle"[81], in fact is something media-epistemologically different, a picking-up of a completely new kind: digital sampling

- the Edison phonograph announced in the journal *Scientific American*: "That the voices of those who departed before the invention of the wonderful apparatus <...> are for ever stilled is too obvious a truth; but whoever has spoken or whoever may speak into the mouthpiece of the phonograph, and

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descriptors and corpus-based musicology: Techniques for modelling music cognition, in: Systematic and Comparative Musicology: Concepts, Methods, Findings, hg. v. Albrecht Schneider, Frankfurt am Main u. a. (Peter Lang) 2008, 133-153 (140)

80 See Andrey Smirnov, Sound in Z. Experiments in Sound and Electronic Music in early 20th Century Russia, London (Koenig Books) 2013, 44

81 Harald Haack, Die erste Klangaufzeichnung. Eine Audiografie, *online* http://newsbattery.blogsport.de/2008/05/07/die-erste-klangaufzeichnung-eine-audiografie

whose words are recorded by it, has the assurance that his speech may be reproduced audibly in his own tones long after he himself has turned to dust. <...> A strip of indented paper travels through a little machine, the sounds of the latter are magnified, and our great grandchildren or posterity centuries hence hear us as plainly as if we were present."[82]

- technical media (different from alphabetic phonetic writing which "freezes" the human voice into a range of a very limited symbolic code) are able to de-freeze recorded voices in almost all frequencies (that is, the Lacanean "real" of the voice) by re-play.[83] After two millennia of the phonetic alphabet there is a new kind of cultural technology as sound recording

- literally retrieving *signals* from the past, new privileged ways of connecting to the past *via* the communication channel rather than by the coded symbols (the traditional archival record). But this signal channel is cut by the digital sampling of such records, such as the software IRENE which reads out graphical grooves by the „virtual stylus“ and audifies them (at the Berkeley Laboratory, by Carl Haber) = argument in Patrick Feaster's lecture "Sound Archives *avant la lettre*: Audio Collections of the Nineteenth Century (1850s-1890s)", conference *Listening to the Archive. Histories of Sound Data in the Humanities and Sciences*, 11-13 February, 2016, Berlin, Humboldt University / Max Planck Institute for the History of Science

- performed with the free, open access software ImageToSound - which at the same time, media-archaeologically, recalls the technical epistemology of the sound film (*Lichtton*)

- inbetween the alphabetic metaphor and signal reproduction, the "Graphophone" has been the name for play-back device for phonographic records

- phonographic groove is a „graph of a sound over time“ (Feaster): mathematical derivative (*Ableitung*) over time; a kind of analog computing

- time rate of the retrieved sound can be defined if there is recording of an accomanying pilot tone as well, such as on Scott de Martinville's phonautograms by means of a tuning fork

- read out from handwritten archival „manuscripts“ the modulated overtones which vibrated (when speaking while writing aloud, like in early Greek and Medieval times): overlay; separate by Fourier analysis

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82 Anon. (The Editor), A Wonderful Invention - Speech Capable of Indefinite Repitition from Automatic Records, in: *Scientific American*, 17. November 1877, 304; see chap. 6 "A Resonant Tomb", in: Jonathan Sterne, The Audible Past. Cultural Origins of Sound Reproduction, Durham / London (Duke University Press) 2003, 287-334 (297 f.)

83 See John Durham Peters, Helmholtz, Edison, and Sound History, in: Lauren Rabinovitz / Abraham Geil (eds.), Memory Bytes. History, Technology, and Digital Culture, Durham / London (Duke University Press) 2004, 177-198

- revolving form of the Edison cylinder respectively the gramophone disc is necessary for machine reading since a time signal unfolds, different from human reading which can be non-linearly arranged line-wise on the geometric writing page

- audifying very first phonographic recodings efforts by Éduouard-Léon Scott de Martinville resulted in indiscernable noisy patterns: *Message ou Bruit?*[84] From what moment on can we speak of „first sound“ or „speech“ records? Here, the media-archaeological moment starts to irritate human cognition. Media-archaeological work which steays close to the signal is non-hermeneutic "understanding" of cultural expression

Active media archaeology: Sonic revelation (articulation) from the past (*Au Claire de Lune*)

- emphasis on "sound" memory / storage / transmission, since this has been the most "immaterial" cultural articulation (before the electronic age) already

- historical research academically a text-based science, opposed to a science of signals which has opened a new field of research not just as an additional source for historical inquiry; with photography, the phonograph and with cinematography an alternative field of agenda has been set

- so-called Humanities (as defined by Wilhelm Dilethey) not sufficiently concerned with the physically real - due to the limits of hermeneutics as text-oriented method, to the priligeging of narrative as dominant form of representation and because of an essential lack of non-symbolic recording media of the real. Battles have been described and interpreted, but the real noise and smell of a combat could not be transmitted until the arrival of the Edison phonograph[85]

- slow run time of acoustic waves even led to the reversal of the cause-effect relation of combat noise in the age of technological warfare - reversed time. When in Second World War a German A4-rocket hit London, the articulation of its acoustic near-coming already lagged begind the destructive event. No longer is a danger previously being announced

- phonography does not just help historiography to higher precision; rather explores new forms of tempor(e)ality on the level of the physically and mathematically real (techno/logy); get tuned to this new epistemology, not by texts and the spoken word, but by a French childrens' song: *Au Claire de Lune*. In an act of active media archaeology by the computer itself is has been

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84 Lecture title by Michel Foucault, read at a conference of medical research in Paris, xxx

85 See Bernhard Siegert, Das Leben zählt nicht. Natur- und Geisteswissenschaften bei Dilthey aus mediengschichtlicher Sicht, in: Claus Pias (ed.), Medien. Dreizehn Vorträge zur Medienkultur, Weimar 1999, 161-182 (175), referring to: Wilhelm Dilthey, Die Abgrenzung der Geisteswissenschaften. Zweite Fassung, in: same author, Gesammelte Schriften VII, 311

achieved that the graphic recording of Léon Scott's analyses of the human voice could be re-transformed into acoustic artikulation

- Phonautogram Lèon-Scotts 8th April, 1860, Paris: song "Au clair de la lune, Pierrot répondit"; http://www.firstsounds.org/sounds/1860-Scott-Au-Claire-de-la-Lune-09-08.mp3

- from such an operation, re-discovery of a song expected, but what primarily acoustically emanates is noise - just like the first (archived) recording of sound in Norway, a tinfoil flattened to a "document" and annotated by a remark by a former collector who claims this has been the first Norwegian recording of music on Edison cylinder; digital reading of this record (at a laboratory in Southampton) lead to nothing but noise

- What articulates as almost Freudean "it"self is noise such as can be expected in any transmission channel according to the theory of communication developed by Claude Shannons - a theorem which can be extended to transmission in time as well, that is: tradition. In such noise articulates itself what baroque allegories showed as the nagging "tooth of time" - the articulation of physical entropy, the manifestation of the temporal arrow; according to the Second Law of Zweiten Thermodynamics each system tends, over time, to increasing dis-order

- Against the noise of the really physical world, culture (especially techno-logical, that is: "digital" culture) poses a negentropic insistance, a negation of decay and passing (away).

- Digital copies of digital records can be produced almost without loss of data (except the quantization noise[86]). Music on Compact Disc or a digitale video can be reproduced frequently with stable quality which was utopean in recent times of analoge recording on magnetic tape. The secret of this temporal invulnerability is that it is just (physical representations of) numbers which are written on the Compact Disc; even after a thousand copies thus a zero stays zero and one remains one[87]

- symbolic temporal order of "history" (i. e. almost time-invariant "tradition") differs from the entropic deterioriation of the electric charge and chemical carrier of the magnetic tape in real physics

- Whereas an analog sound carrier, which is in-formed physical materiality, can still be identified according to the criteria of the historical method, digital signal transfer primarily is information in its communication engineering sense (given by Shannon), that is: unbound from energy and matter (as Norbert Wiener in his *Cybernetics* insists)

- really first recording of sound (in the media-archaeological sense) has been preserved as relic (in Droysen's sense "Überrest"), which is as un-intentional

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86 Siehe Wolfgang Hagen, Die Entropie der Photographie, in: Herta Wolf (Hg.), xxx

87 Rudolf Taschner, Der Zahlen gigantische Schatten. Mathematik im Zeichen der Zeit, Wiesbaden (Vieweg) 3. Aufl. 2005, Anm. 77

tradition (a Proustean *mémoire involontaire*, a Bergsonean "counter-archive" as defined by Paula Amad) originating from Léon-Scott's "Phonautograph" on a turning cylinder (the Kymograph as universal epistemological recording medium of 19th century), once invented not for purpose of replay or for transmission posterity, but just for immediate phonetic analysis (techno-linguistics)

- in media-active signal research, technological apparatus itself turns out to be the archaologist proper. Patrick Feaster and David Giovannoni thus succeeded in re-sonifying the preserved phonautographic engravings ("Schallbilder"), beginning with Scott's recording of a sound folk tone of 435 Hz in the year 1859. 150 years later science realized that with optical "reading" of such acoustic signal lines sound can be re-synthesized, and all of the sudden a children's song sounds again. What metaphorically looks like the pick-up of sound images by a "virtual, digital gramophone needle"[88], in fact is something media-epistemologically different, a picking-up of a completely new kind: digital sampling.

Sonic arts / acoustic archaeology

- enunciations from an Edison wax cylinder, as once expressed by Michel Foucault in a slightly different context: "Message or bruit?"

- opto-digital reading of early Edison cylinders allows for listenting again to otherwise unaccessible sound recording; the opto-digital *close reading* of sound as image, though, dissolves any meaningful unit into discrete blocks, which are accessible for human analysis only by operative techno-mathematical diagrams:

- "spectrogram of such a reconstructed acoustic recording as an analytic, media-archaeological deciphering

- the "media-archaeological ear", as an alternative to the cultural emphasis on musical semantics; installation by Yuri Suzuki at the Ars Electronica in Linz, September 2009, *The Physical Value of Sound*, explicitely based on the electro-mechanics of (manipulating) records (their speed) and pick-up systems (their non-linear use); www.yurisuzuki.com; micro-physical *close reading* of sound; dissolves any semantically meaningful archival unit into discrete blocks of signals. Instead of musicological hermeneutics, the media-archaeological gaze is required here - a reminder of light-based sound inscription in early film

- media archaeologist, without passion, does not hallucinate life when he listens to recorded voices. To the media-archaeologically sharpened mind, an animated figure on a computer screen will never be confused with a living being since such a mind is conscious of the algorithms of which such an animation is a technomathematical, processual function

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88 Harald Haack, Die erste Klangaufzeichnung. Eine Audiografie, *online* http://newsbattery.blogsport.de/2008/05/07/die-erste-klangaufzeichnung-eine-audiografie

- against the scarcity of instrumental artefacts and doubtful textual evidence from ancient music theory, anachronistic option computational re-calculation of Aristoxenean arguments (PhD Carlé)

SPEECH SYNTHESIS / VOCODER

The Vocoder

- advanced speech security system developed by Alan Turing in the Second World War, "Delilah"

- voice scrambling capabilities of the vocoder, better known for its role in the history of electronic music than for its cryptologic potential

- SIGSALY 1943: matched pair of one-time-use vinyl records of random thermal noise, played synchrounsly. Sender: wrap spoken message in noise; receiver: filter

- Turing's *Delilah* for discrete voice encryption

- Aleksandr Solzhenitsyn describes his develpment of speech encipherment (approx. 1947-50) in his novel *The First Circle*

- "Extended Voices": Alvin Lucier's *North American Time Capsule* (1967): instructing performers of the Brandeis University Chamber Chorus to communicate Earth's present situation to beings from a faraway space or time by use of vocoder

- Kraftwerk's *Trans Europa Express* 1977 using Sennheiser VSM 201 Vocoder

- Vocoder runs the input speech through a series of bandpass filters, which measures the amount of energy in earch band and sends them as information, i. e. encoded; captures spectral information of the voice; receiver approximates it to the original voice

- "Probing the Past: A Media Archaeology of Handmade Electronic Sound" (Derek Holzer, 27.5.15, Kolloquium, Medientheater); see http://tinyurl.com/probing-the-past-oldenburg; Holzer's installations "no re-enactment", but from the media-archaeological point of view, there is no historical context / distance. The coupling of the tone wheel and a photo-electric cell actually behaves the same 1930 and 2016

Un-natural: Artificial voices

- Wolfgang von Kempoelen paradigm 1791: imitating human organs; still extension of men (Kapp / McLuhan), epistemologically different from genuine mathematical voice analysis / synthesis (Leonard Euler)

- 1819 Charles Cagniard de la Tour: two punched discs, one rotating; number of

holes results in pitch; multiplied with rotation speed

- Hermann von helmholtz 1863 *Die Lehre von den Tonempfindungen als physiologische Grundlage für die Theorie der Musik* / vocal synthesizer

- 1939 Homer Dudley, world exposition New York, for Bell Laboratories: Voder = Voice Operation Demonstrator, manually directed, models physiological components byelectronic units: noise generator for voiceless phonems and sine tone generator for vowels; operator can control 10 band filters for modulation of signals, and generate pauses; pedals allows for pitch;

generating sound / reverse: Welte-Mignon recording piano

Vocoder for multiplex telephoning and encryption = Voice Encoder / coding; analyzes incoming sound into frequency partials (Fourier), after transmission re-modulated by a noise signal,

Pattern Playback by Frank Cooper: synthesieses sound and speech by spectrograms

- by technical measuring of the human voice, it turns out in-human; most natural human articulation is revealed as completely un-naturally re-composable as artefact

- the natural itself can be given a "voice". A high-speed playback of an earthquake has been used by the seismological laboratory of the California Institute of Technology "as an input for a speech sonograph. The sonograph facilitates the study of transient effects" = Speeth: 909, note 5

- Mills 2010, 36: Built at the Bell Telephone Laboratories of American Telephone and Telegraph (AT&T), vocoder went beyond previous experiments with graphic inscription; revealed new ways for multiple messages to be passed down the same telephone wire, simultaneously; indicated that certain aspects of a vocalization could be subtracted without a listener perceiving any change. Speech could be broken into bits, much like “the subject” — which, Lacan had announced, “is no one. It is decomposed, in pieces. And it is jammed."[89]

- the act of hearing (within the human ears mechanism) is *alreadv* an analysis of the perceived sound waves into discrete impulses which become the impression of voice only by brain action (Hermann von Helmholtz insists)

- Dudleys "vocoder" different from the simple "voder"; voice became evident "comme diagramme du corps" (Catherine Paoletti) in the moment of spectrographic analysis

- with phonography not only the symbolic order (music) was recordable but the sonicity of the oral poetry event: the acoustic signal, the micro-temporal

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89 Jacques Lacan, The Seminar of Jacques Lacan, Book II: The Ego in Freud’s Theory and in the Technique of Psychoanalysis, 1954 – 1955, ed. Jacques-Alain Miller, trans. Sylvana Tomaselli (New York: Norton, 1991), 54 (as quoted in Mills 2010: 36)

variations

- Homer W. Dudley as electronic and acoustic engineer created the electronic voice synthesizer for Bell Labs (mostly in Bell Labs' Telephone Transmission Division) in the 1930s. More secretly, Dudley led the development of a method of sending secure voice transmissions during World War Two

- the uncanny in electronic engineering is that something completely non-vocal, concretely: a circuit of condensers and resistors, powered by electric current, can emulate human speech - thereby, in reverse, dis-covering the artificiality of human speech itself as spectrum event

- among Dudley's final projects: design of an electronic kit distributed by Bell Labs for home hobbyists and students, called *Speech Synthesis: an Experiment in Electronic Speech Production*; contained the components with which to create an electronic circuit that could produce three different speech formants

- Teuvo Kohonen carried out an algorithmic experiment "with natural data" <Kohonen 1984: 148> which were collected in speech recognition in order "to visualize the topological or metric relations between phonemes picked up from continuous speech. "The inputs to the processing units consisted of spectra of natural speech, taken at 15 different frequency channels" <ibid.> - analogous to Vocoder analysis. One resulting SOM "shows at which processing unit each phonemic sample caused the maximum response" <ibid.>: Fig. 5.24a-b = Kohonen 1984: 148. In the self-organizing map (SOM), the sonic Wunderkammer returns - but in its contemporary form as an *operative diagram*

- processed by Markov chains, the human speech turns into similiarity-based dis/order, as applied to Friedrich Kittler's voice itself: [Audio] kittler-kov-Carle.mp3

- museological *Wunderkammer* premise allows for the indifference to the ontologically emphatic distinction between art and nature, human and machine, live and animation, logocentristic presence and technical re-presencing (phonographic voices / synthesized sound)

- specific escalation of the "sonic Wunderkammer" = dichotomy between natural and unnatural voices

- voices from tele-communication devices: irritations of "presence" / the present as the eqivalent of the visual / material Wunderkammer in the temporal domain of subjective time experience

- Siren ambivalence with Blanchot

- man is most human when communicating in singing and speech (as defined by Aristotle and Wilhelm von Humboldt[90]). are addressed to his ear. But this means man becomes inhuman if he can not tell the natural voice from the

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90 Wilhelm v. Humboldt, Über Denken und Sprechen [MS 1995/96], in: W. v. H.l, Werke, ed. Albert Leitzmann, vol. 7,2, Berlin 1907 (reprint: Berlin (de Gruyter) 1968]

artificial Voder or Vocoder.

- not "from" telephone (Alexander Bell 1976) "to" Vocoder (Dudley in the Bell Laboratories, patented 1939); rather immediacy; with Vocoder, human voice is only disembodied (the telephone, phonograph and radio experience), but by analysis into segments of its frequencies and transcoding for transmission becomes de-personalized (Christoph Borbach). From "he" or "she" to "it"; loss of the "grain of the voice" (Roland Barthes)

- individuality of voice, once coded for unrecognizable transmission, eliminated by Vocoder; noise instead

- "Dictionaries <...> may record a new item under *voice*: *voice terminal*, a computerized telephone. No longer, then, the illusion that the instrument transmits voice at a distance, carrying it unchanged over space and time; voice now passes through the circuits"[91] - and are therefore transduced from signals into computable numbers. "Receiver and sender are at their terminals, voice terminated. The end of the voice and the beginning of the terminal" <ibid.>.

Whereas analogue telephony is transduction of mechanical vibrations to voltage variations, the Vocoder symbolically transcodes it.

Helmut Holzer's spatial installation *Delilah Too Voice Encoder Project* at the "UnTune" exhibition of CTM Festival 2015 (Kunstraum Kreuzberg, February 2015) confronted the visitor with an acoustic *Wunderkammer*, since he participants experienced their own voice as complete alienation.

- "Speech, to the telephone engineer, is a commodity that must be picked up in one place and delivered promptly, cheaply, and in good condition in another" = D. W. Farnsworth in "High-Speed Motion Pictures of the Human Vocal Cords" (1940), as quoted in: Mara Mills, Deaf Jam. From Inscription to Reproduction to Information , in: Social Text 102 • Vol. 28, No. 1 • Spring 2010 , 35-58 (35)

- Mills 2010, 36, about the Vocoder: "Built at the Bell Telephone Laboratories of American Telephone and Telegraph (AT&T), this machine <...> revealed new ways for multiple messages to be passed down the same telephone wire, simultaneously. And, it indicated that certain aspects of a vocalization could be subtracted without a listener perceiving any change. Speech could be broken into bits, much like “the subject” — which, Lacan had earlier announced, “is no one. It is decomposed, in pieces. And it is jammed.”4 " Note 4 = Jacques Lacan, The Seminar of Jacques Lacan, Book II: The Ego in Freud’s Theory and in the Technique of Psychoanalysis, 1954 – 1955, ed. Jacques-Alain Miller, trans. Sylvana Tomaselli (New York: Norton, 1991) , 54]

- once human voice itself became subject to spectrographic analysis, it turned out machinic (van Kempelen's effort / Homer Dudleys "vocoder" different from the simple "voder"). "Homer" Dudleys "Christian name" allows for a combinatorial reminder: The vocal alphabet - the adding of single letters to

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91 Jonathan Goldberg, Voice Terminal Echo. Postmodernism and English Renaissance Texts, New York / London 1986, 1

express single vowels AEIOU has been a "technological" (Ong) modification of the Phoenecean syllable alphabet - has been invented to write down HOMER's oral poetry in a quasi-phonographic way, to preserve the musicality of its articulation - grammo-phonic avant la lettre in the sense of "musical" letters. But only with phonography not only the symbolic order (music) was recordable but the sonicity of the oral poetry event: the acoustic signal, the micro-temporal variations

- Homer W. Dudley (1896–1987) as electronic and acoustic engineer created the first electronic voice synthesizer for Bell Labs (mostly in Bell Labs' Telephone Transmission Division) in the 1930s (at that time a division of Western Electric Company

- more secretly, Dudley led the development of a method of sending secure voice transmissions during World War Two

- *Wunder* in electronic engineering is that something completely non-vocal, concretely: a circuit of condensers and resistors, powered by electric current, can emulate human speech - thereby, in reverse, dis-covering the artificiality of human speech itself as spectrum event.

- kit entered production in 1963 and was produced until the late 1960s; cp. Speak-and-Spell kit

"Frozen" voices

- signal recording vs. techno-mathematical analysis / resynthesis in the media-archaeological, thus: techno-mathematical approach. Electronic synthesis of the human voice thus emerged: materially refined electronics (*techné*) and mathematical analysis (*lógos*). Boris Yankovsky's method of computing the human voice treats sound matter in a fully formal approach. A combination of a mathematical model of the synthetic tone ("syntone") and its implementation in a processing mechanism (Vibroexponator) turns the symbolical abstraction into a media event in physical time. In order to get to the essence of sonic articulation, a suspense from any imagination of sound has first to take place - operative sonicity: "To synthesize the human voice singing a vowel, one would need to choose several templates related to formants (drawn waveforms [...]), to add extra templates as needed [...], to recalculate their sizes according to the desirable frequencies and intensities of formants, and then to mix them. The final waveform would sound like a 'frozen' vowel. This waveform could be used to produce a temporal 'quant' of sound, physically related to one frame of the film. To produce the sound, dynamically changing in time, one would have to calculate the sequence of static frames, in which each frame represents the successive state of changing timbre."[92]

92 Smirnov 2012: 215, referring to an unpublished manuscript by Boris Yankovsky, teorya i praktika graficheskogo zvuka. Akusticheskiy sintez muzikalnih krasok [The Theory and Practice of Graphical Sound. Acoustical Syntheses of Musical Colours], Leningrad (between 1932 and 1940), in the Archives of the Teremin Center, Moskow. See Andrey Smirnov, Synthesized Voices of the Revolutionary Utopia, in: Dmitri Zakharine / Nils Meise (eds.),

"Harmonizing" voices by sampling

- phonograph, gramophone and magnetic recording have been "incapable of achieving real-time frequency shifts. For this we need rock bands with harmonizers that are able to reverse—with considerable electronic effort - the inevitable speed changes, at least to deceivable human ears" = Friedrich A. Kittler, Gramophone, Film, Typewriter (1986) trans. Geoffrey Winthrop-Young and Michael Wutz, Stanford (Stanford University Press, 1999, 35; pitch shifter (Harmonizer) *transposes* male voices into female ones *in real-time* indeed, by computationally recalculating the frequencies

"Cold" speech synthesis

- in telephony, acoustic signal "heats up" the human sensual perception (McLuhan); its mathematical analysis cools it down; media-archaeological, that is: techno-mathematical approach such as the electronic synthesis of the human voice which takes place as a coupling of materially refined electronics (*techné*) and mathematical analysis (*lógos*)

- truly techno-epistemic approach to modeling the human voice does not imitate the organic human vocal tract by mechanical analogies but analyses the voice as signal event and wave form itself. Once techno-mathematically analyzed (like with von Helmholtz' "Resonators"), the complex sonic colour can be composed from single sine waves. When Boris Yankovsky in the 1930s founded his Syntonfilm Laboratory in Moscow it was based on his media-operative insight into the genuinely time-critical nature of sound waveforms as temporal transitions; detected "life inside the sound spectrum"[93]. The mathematical approach and "graphic sound" of a non-metaphorical kind - sonagrams as the diagramatic expression of dynamic development of the sound spectrum in time - uncover the layers of sonicity. Sound could be analysed and represented as the Fourier series of periodic functions - and consequently be re-synthesized back with the same set of sine waves.[94] Yankovsky treated the human voice in a fully formal approach.

- combination of a mathematical model of the synthetic tone ("syntone") and its implementation in a processing mechanism (Yankovsky's "Vibroexponator") turns the symbolical abstraction into a media operation which takes place in actual physical time

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Electrified Voices, Konstanz (V&R unipress) 2012, 163-185

93 Boris Yankovsky, Analiz i sintez tembra, unpublished article Moscow, March 1935; quote and translation: Andrey Smirnov, Sound in Z. Experiments in Sound and Electronic Music in early 20th Century Russia, London (Koenig Books) 2013, 209

94 Boris Yankovsky, Teorya i praktika graficheskogo zvuka. Akusticheskiy sintez muzikalnih krasok [The Theory and Practice of Graphical Sound. Acoustical Syntheses of Musical Colours], Leningrad (between 1932 and 1940), in the Archives of the Teremin Center, Moskow, as quoted and translated by Smirnov 2012: 210

- to get to the essence of sonic articulation and to synthesize the human voice singing a vowel, a suspense from any semantically hot imagination of sound has to take place, a cooling by analysis: "The final waveform would sound like a 'frozen' vowel"[95]

- Greek vocal alphabet probably has been arranged for the special purpose of recording the musicality of poetry (cultural recording as symbolical operation); the current digital code returns to first expressions of pre-Grecian writing which have been invented for *calculating* purposes[96] - now calculating on the level of digital signal processing with a precision in reproduction which emulates the natural signal itself (due to the Nyquist / Shannon sampling theorem). Fourier Analysis allows for the mathematical transformation of a temporal function or sequence of signals into a spectrogramm; Fast Fourier Transformation as analytic operation performed by the computer itself when translating a recorded voice event into a mathematical regime, thus allowing for a kind of cultural analysis in ways which only computing can do. At that moment, the machine is the better media-archaeologist than any human. Only by application of such technological tools can we explain the micro-temporal level of such events. Computer-based Fast Fourier Analysis gives access to another worldliness of a cultural moment. Consequently, a book cover on the origins of the vocal alphabet (W. E. / Friedrich Kittler (eds.), Die Geburt des Vokalalphabets aus dem Geist der Poesie. Schrift - Ton - Zahl im Medienverbund, Munich (Fink) 2006) shows both an image of one of the first Greek alphabetic inscriptions (remarkably in hexametric diction) *and* the spectrogram of the same verse line read and spoken by Barry Powell: see Barry Powell, Homer and the Origin of the Greek Alphabet, Cambridge (UP) 1991

PHONETIC "SOUND" AND THE UN-ARCHIVABLE

A different kind of recording: The phonographic un-archive

- sound and speech have been most “immaterial” cultural articulation (before the electronic age); phonographically recorded acoustic real "forms the waste or residue that neither the mirror of the imaginary nor the grid of the symbolic can catch: the physiological accidents and stochastic disorder of bodies"[97]

- *digital* audio recording *integrates* the vibrational "calculation" of sound, close to the Turing Machine states and chrono-photographical sequences of stills than to analog phonography; Alan Turing's paper "On Computable Numbers" 1936 reconciliated real numbers with the symbolical machine

- BBC World Service launched the "Save our Sounds" project, may soon be lost due to the post-industrial world. But caution, this is not an archive: As long as

95 Smirnov 2012: 215, referring to Boris Yankovsky's "Theory and Practice of Graphical Sound"

96 See Denise Schmandt-Besserat, Before Writing, vol. I: From Counting to Cuneiform, Austin (University of Texas Press) 1992

97Kittler 1999: 15 f.

an algorithm is missing which rules the transition of sound provenience to permanent storage, it is just an ideosyncratic random collection

- musical notation (developed by Greeks and Guido of Arezzo in analogy to the alphabet) is still symbolic recording, the phonograph registers the physically real signal. While alphabetic symbolism reduces acoustic events to the "musical" (harmonical) order, the register of the acoustic real encompasses the whole range of the sonic (including noise and arhythmical temporal phase shifting such as "swing" and differing amplitudes / frequencies

- due to the limits of hermeneutics as text-oriented method, and because of an essential lack of non-symbolic recording media of the real. Battles have been described and interpreted, but the real noise and smell of a combat could not be recorded for the archive and transmitted until the arrival of the Edison phonograph[98]; did not just provide historical research with a new kind of source material; it rather articulated new, rather ahistorical forms of tempor(e)ality on the level of the physically and mathematically real (techno-logy)

- listening dependent on sound as event in matter? In the symbolic order of score notation, "structural listening can take place in the mind through intelligent score-reading, without the physical presence of an external sound source."[99] As once conceived by Theodor W. Adorno, "the silent, imaginative reading of music could render actual playing as superfluous as speaking is made by reading of written material"[100]

- muscial scores usually end in paper archives, not on gramophone records. "Notation wants music to be forgotten, in order to fix it and to cast it into identical reproduction, namely the objectivation of the gesture, which for all music of barbarian cultures martyrs the eardrum of the listener. The eternization of music through notation contains a deadly moment: what it captures becomes irrevocable ... Musical notation <...> is about eternity: it kills music as a natural phenomenon in order to conserve it — once it is broken — as a spiritual entity: The survival of music in its persistence presupposes the killing of its here and now [...]"[101]

- with the phonograph, hearing became attentive of all kinds of sounds, regardless of their source, quality and meaning(lessness), just like the inner ear

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98 See Bernhard Siegert, Das Leben zählt nicht. Natur- und Geisteswissenschaften bei Dilthey aus mediengschichtlicher Sicht, in: Claus Pias (ed.), Medien. Dreizehn Vorträge zur Medienkultur, Weimar 1999, 161-182 (175), referring to: Wilhelm Dilthey, Die Abgrenzung der Geisteswissenschaften. Zweite Fassung, in: same author, Gesammelte Schriften VII, 311

99 Rose Rosengard Subotnik, Deconstructive Variations. Music and Reason in Western Society, Minneapolis (Univ. of Minnesota Press) 1996, chap. 3 ("Toward a Deconstruction of Structual Listenting. A Critique of Schoenberg, Adorno, and Stravinsky"), 148-176 (161)

100 Subotnik 1996: 161f

101 Theodor W. Adorno, Zu einer Theorie der musikalischen Reproduktion, Frankfurt/M. (Suhrkamp) 2001, as quoted by G. Mazzola, Musical performance. Springer, Heidelberg 2010

impassionately transduces vibrations analogue to electro-mechanical sound reproduction[102]; listening became ahistorical, subject to the time-invariant reproducibility of acoustic signals; a tone exists only in transience, that is: as Husserlean "time-object"[103]

- archaeologists = technical media themselves - not so-called mass media, but measuring instruments which are able to decipher physically real signals techno-analogically, and representing them in graphic forms alternative to alphabetic writing: „moving“ diagrams, as performed by the oscilloscope

Remembering past sonospheres by technical media

[http://strangeattractor.co.uk/shoppe/rorschach-audio/ http://rorschachaudio.wordpress.com. Trade distribution by Turnaround Art Theory, Cultural Studies. An early MIT Press version of "Rorschach Audio" has been published 2001]

With the refinement of the Phenician alphabet to the Greek phonetic alphabet (which Ong actually called a "technologizing of the word"[104]), acoustic articulation (speech, singing, oral poetry) became symbolically recordable for re-play; presence-generating power of technically recorded voices differs fundamentally from the *grama*-phonic notation of speech in the vocal alphabet

- "Discourse analysis cannot be applied to sound archives or towers of film rolls"[105]

- "Hearing the cracks and noises of a phonograph recording may initially enlighten their historical status as 'mechanical' instruments."[106] In terms of the mathematical theory of communication (Shannon 1948), such cracks belong to the kind of "noise" introduced by the channel of transmission itself which is here: the channel called time

- media archaeology starts here: The phonograph as media artefact does not only preserve the memory of cultural semantics but "archivizes" past *technical* knowledge as well, a kind of frozen media knowldege embodied in engineering and waiting to be un-revealed by media-archaeological consciousness

- "Listening to Technology"[107] really means *close listening* to the technological

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102 Jonathan Sterne 2003: 33

103 See Edmund Husserl, The Phenomenology of Internal Time Consciousness, trans. James Churchill, Bloomington, Ind. (Indiana University Press) 1964

104 Walter Ong, Oralität und Literalität. Die Technologisierung des Wortes, Opladen (Westdt. Verl.) 1987

105 Friedrich Kittler, Gramophone - Film - Typrewriter, Stanford (UP) 1999, 5

106 Karin Bijsterveld, Mechanical Sound. Technology, culture, and Public Problems of Noise in the Twentieth Century, Cambridge, Mass. / London (The MIT Press) 2008, 26

107 See Bijsterveld 2008, chap. 1

artefact itself. The Museum of Endangered Sounds takes care of the sound of "dead media"[108], and the Technical Committee of IASA in its recommendations from December 2005 insists that the originally intended signal is just one part of an archival audio record; accidental artefacts like noise and distortion are part of it as well - be it because of faults in the recording process itself or as a result of later damage caused in transmission; both kind of signals, the semantic and the Proustean *mémoire involontaire*, message *and* noise, be preserved in media-archival conservation ethics; media-archaeological listening to the *sonic* past rather about listening to the technical signifier than to the acoustic or musical content

- with digital sampling and processing of audio-signals, noise resulting from the frictions of analog technologies is significantly filtered, thus: silenced; former noise replaced by an even more endangering challenge: the "quantizing noise" on the very bit-critical (technical) level of signal sampling, and the migration problems of digitally compressed media data; physical vulnerability of electronic storage media; not just a technical question, it has an epistemological dimension as well[109]

Is there a "sound of the archive"? Listening to silence with media-archaeological ears

- software for sound analysis *Audacity* actually provides an algorithm called "Silence Finder". In the negative sound, its silence, we listen to the past in its truest articulation

- not only implicit (sonicistic) but as well actual sound from the media-archaeological archive. When an ancient "Datassette" is being loaded from external tape memory into the ROM of a Commodore 64 computer, we are actually listening to data music. What we hear is not sound as memory content like an old persussion-assisted song, but rather the sound of computer memory itself, that is: a software program which is "scripture" (though in the alphanumeric mode); Ben Anderson, Recorded music and practices of remembering, in: Social and Cultural Geography, vol. 5, No. 1, March 2004, 3-19; listening to the data archive which is not sonic memory but sonicity

- silence re-interpreted as an enduring negation of time-based sound, as performed in John Cage's piece *4'33*.[110]

- Edison phonograph the first form of "memory in motion", since its "records" (notably the early ethnographic field recordings around 1900, institutionalized as the Vienna Phonograph Archive and the Berlin Phonogramm Archive) is based on a continuously rotating, technically moving apparatus both in recording and in re-play

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108 See the Website „Museum of Endangered Sounds“, *online* http://savethesounds.info

109 See Arild Fetveit, Medium-Specific Noise, in: Liv Hausken (ed.), 189-215

110 On the occasions which led to this composition see Seth Kim-Cohen, In the Blink of an Ear, New York (Continuum) 2009, 160ff

Material entropy of the signal *versus* symbolic (archival) endurance of sound recording

- Bill Viola in his essay on the implicit *sound* of electronic images points out "the current shift from analogue's sequential waves to digital's recombinant codes" in technology.[111] Sampling and quantizing of acoustic signals analytically transforms the time signal into the information of frequencies which is the condition for technical re-synthesis (Fourier transformation). Digitalization means a radical transformation in the ontology of the sound record - from the physical signal to a matrix (chart, list) of its numerical values. Media culture turns from phonocentrism to mathematics

- the techno-mathematical *archive*; transfer techniques of audio carriers from technically extended "writing" such as analog phonography to calculation (digization), not just another version of the materialities of tradition, but conceptual change; basically atemporal dimension. Against the noise of the real culture (especially techno-logical, that is: „digital“ culture) poses a negentropic insistance, a negation of decay and passing-away

- digital copies of digital records produced almost without loss of data (except the quantization noise). Music on Compact Disc or a digitale video can be reproduced frequently with stable quality which was utopean in recent times of analoge recording on magnetic tape. The secret of this temporal unvulnerability is that it is just (physical representations of) numbers which are written on the Compact Disc; even after a thousand copies thus a zero stays zero and one remains one[112]

- past sound should not just be "restored" by applying digital filters; it rather wants to be remembered with all the traces of decay which has been part of its tradition, its media-temporal (entropic) characteristics must be archivized as well; remain close to the physical record which is achieved by over-sampling; stay tuned to such non-archival sonicity

111 Viola 1990: 47

112 Rudolf Taschner, Der Zahlen gigantische Schatten. Mathematik im Zeichen der Zeit, Wiesbaden (Vieweg) 3. Aufl. 2005, note 77