

NOTEBOOK "VOICE SIGNAL PROCESSING"

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NOTES ON THE PHONOGRAPHIC APPARATUS

Phonography: Recording the volatile

- in cultural history, sound among the most ephemeral and transient, thus: time-critical forms of articulation, until arrival of the phonograph allowed for its reproduction at will (as expressed by Edison 1878 = Lisa Gitelman, *Always Already New. Media, History and the Data of culture*, Cambridge, Mass. (MIT Press) 2006, 25 ff.; sound losing its temporal quality of "being-to-death"; technical recording of sound allowing to discover the time-critical essence of sound itself; literally kymographic media ("wave-inscribing") like Edouard Léon Scott's phonoautograph allow to measure the same acoustic event (an octave, for example) as vibrational event, as a superimposition of fundamentals and overtones; since Edison's phonograph recorded vibrations and not symbolic scores (physical acoustics instead of cosmological Pythagorean harmonics), measure of musical harmonies by length technically replaced by time as an independent critical variable = Friedrich Kittler, *Gramophone - Film - Typewriter*, Stanford (Stanford UP) 1999, 35 ff.

- December 2007 *Phonographic Salon* in and as Media Theatre (Media Studies, Humboldt University); what literary historians 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

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; recording himself narrating a text, playing the recording back into the room, re-recording it; new recording then played back and re-recorded; process repeated 32 times - induced by 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 turning 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

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

- non-invasive writing re-turning from within computing, as digital encoding

- 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 belonging to what Jules-Étienne Marey once called the "graphical method" (analog registering of signals by curves) and explicitly 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 replacing 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

- in replay of sound recording on gramophone disc, 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
- music as concept and sound vs. event (Hanslick); necessity for embodiment in order to become (e)motive: a correferrence between music and high-tec media in relation to their irreducible being-in-time to unfold
- mechanical records still the culturally familiar form of physical impression (writing); electro-magnetic latency a sublime, uncanny form of invisible, non-haptic memory. The voices and sounds emanating from digital audio files 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 Phoenician 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, such notation remaining 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 deterioration 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 strength 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 - turns 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 - message (the emperor) or noise (the scratch)?

- *paraisthesis* the 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. Instead of musicological hermeneutics the media-archaeological ear listens to signals; power of signal-based technical media in their ability to actively (re-)create real presence; an involuntary memory, thus: the memory of the real sonosphere which inadvertently inscribes itself into the record

Lord's Wire Recorder

- "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 tagged 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 Literature*, Cambridge u. a. (Cambridge UP) 2002, 6

- ultimate challenge to the vocal alphabet which could never actually write down the sound of breaking waves which can only be recorded by electro-magnetic media

Retextualizing audio(visual) records: Digitized sound

- active media archaeology, opto-digital reading of otherwise inaccessible sound recording, retrieving past sound signals by digital sampling and quantification; what appears to the ear like the restituted sound, in fact the function of a techno-mathematical matrix / filter
- Florens Chladni experimenting with acoustic wave figures in sand created by the vibrations of the violin bow; visualisation as opposed to mathematical analysis
- "Spektrogramm einer rekonstruierten Tonaufnahme (Wedda-Gesang, Ceylon 1907)" in: Stanke / Kessler, xxx; digital *close reading* of sound dissolves any signal into discrete blocks; textual regime returns (in alphanumeric codes)
- "[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); 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
- algorithmic archaeology the return of "textuality" in the representation of the past, but this time text itself becomes media-active - 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 Yugoslavia by Milman Parry and Albert Lord around 1935: Milman Parry Collection of Oral Literature, Harvard University. In listening to such a sound *online*, the ear tends to be trapped by the referential illusion, believing that it is confronted with the audio signal; in fact, discrete bit-strings are being processed - sublime textuality, operating on the subliminal level of human understanding; Leibniz, "nesciens" - mathematically calculating perception of breaking waves; 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>; textuality becoming powerful beyond humans, within technomathematical machines

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

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

- 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 mobilizing the digitized 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*)

- "historical" musical instrument actually has to be played in order not to decay physically - 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); what is strictly forbidden in traditional archives: to interfere with the original "record"; re-enactment (signal processing) the essence of musical and technical objects; the *archive in motion* its only way of existence: active material philology

- in media-archaeological terms, the very fact that the *gusle* has been recorded on aluminium discs (Parry) and magnetic wire (Lord) reveals the isomorphy between electronics (oscillators, resonance circuit) and vibrational events in human / instrumental culture

- technically induced media-archaeological *Kehre* with phonograph recording; „secondary orality“ (Walter Ong) or "derived" (Foley 1990) revealing the phonographic (vibrational rather than phonetic-alphabetically discreet) nature of human "orality" itself

Speech becoming "immortal"

- 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

- "Speech", as it were, has become immortal", Thomas Alva Edison announces in *Scientific American* of 1877 immediately after *finding* of phonographic signal recording = as quoted in Kittler 1986: 37

- media-phenomenological fallacy; 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' [...]" = Weber 1996: 160

- listening 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 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; task of media studies to open the ears for such understanding

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

- epistemic trauma rooted in the technological shock (since Edison's phonograph) and the "deadly" ambivalences of recording "live" itself; effects and affects of re-presenting the past by media memory; viewer / listener co-affected or even "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 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 Planète* in the 1930 and further projects, Bowles' Moroccan folk song recordings driven by a kind of anticipatory trauma that the indigenous culture he referred to was about to be extinguished; 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 utopian 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)

- "archival potential" of phonographic recordings coinciding with moment "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 musical practice that they interpreted what they heard and transcribed 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 - 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.

- even with his copies of all the tapes he sent to Washington, Bowles never listening 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 no alternating but direct current in some of the local villages, no recording took place at all with the AMPEX magnetophone equipment

- anticipatory technological recording while the culture itself is still intact; escalating in ballistic World War II anti-aircraft prediction. In order for the artillery to fire its bullets "just in time", the data of the approaching enemy aircraft had to be recorded and calculated 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

- techno-cultural *dissonance* rooting 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

- Albrecht Meydenbauer's German Monument Archive (Deutsches Denkmälerarchiv), based around 1900 on photogrammetric measuring of historic architectural heritage, anticipated future destruction of the originals caused by possible wars already; 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

- *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, in: Claudio Fogu / Wulf Kansteiner / ders. (Hg.), Probing the Ethics of Holocaust Culture, Cambridge, MA (Harvard University Press) 2016; conference paper draft version (March 2012)

http://www.toddpresner.com/wp-content/uploads/2012/09/Presner_Ethics.pdf

- as signal communicated *via* air pressure, sound is material, even violent; but as a temporal form it is volatile and perceived as "immaterial" phenomenon; in signal recording, *indistinction* 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 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 implicit mathematical sonicity which is the ultimate shock to occidental logocentrism.

Singers and Tales in the 21st Century: digital memory

- with digitization, a dramatic change of memory records; "big data" of past recordings generated and "social" memory transformed into computability; not just a further escalation of the pick-up / record groove constellation, but in fact an epistemological *transsubstantiation*.

- human epic performance, once being recorded, 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 digital computing, an even more dramatic change takes place which transcends the analog transduction of epic songs; the same kind of steel wire which has been the basis for Albert Lord's magnetic recordings in former Yugoslavia in 1950, all of the sudden, becomes a grid generating the Cartesian matrix texture of an electronic computer memory device, 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 = 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). As RAM the SDS 940 consisted of magnetic core memory units; its very image internally mirrors the social "network" 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.

- digitization of the audiovisual legacy of Parry and Lord on aluminium discs and wire spools in difference to the essence of its cultural content; Plato's primary „media“ critique of writing as an ambivalent memory technology valid again

Motion and immobilization: the audiovisual archive

- in media-archaeological awareness, a phonographic 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 ears to listen to this as well, not to filter this out.

- phonograph as media artefact not only carrying cultural semantic like words and music, but - like any work of art - 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) from Milman Parry Collection at Harvard University, thereby translating the physically real articulation into the symbolical regime which increases "information" in terms of order and selection, but loses additional information like the individual intonation, the temporal subtleties and the accidents, the "noise" as the authentic trace of the unique performance event; with technical reproducibility of movement and sound, cultural memory liberated from restrictions to symbolical notation which leaves us with a bifurcated memory: the symbolical and the real

- as long as 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 a singer's catching thereby is subject to techno-mathematical, non-cultural analysis

- first uses of sound film for musicological documentation "Avdo movie", Milman Parry Collection website. 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 rhythmically: Now the medium speaks; a few seconds later (1:37), the cinematographic 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 anthropological 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, miraculously, 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 fotografiert 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 preserving 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" = Boston (Harvard University Press) 1960, xiii

- technology 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

- media-archaeological retrieval of "lost sound" a delicate detour for the human and technical senses / sensors: Obsolete sound recordings, as distorted signals, are first transformed into spectral images by optical scanning, before being algorithmically processed into sound (or noise, in the barely recognizable case of the "first" Norwegian phonograph recording supposed to be a Biblical psalm). Here, "imagenesis" (Jon-Inge Faldalen) is part of the inner-technical procedure, with the ephemeral function of the image (imaging) being exhausted in generating sound;

https://www.nrk.no/kultur/xl/kan-verdens-eldste-opptak-av-edison-ha-ligget-i-en-norsk-kjeller-siden-krigen_-1.13727285; accessed November 13, 2017

- algorithmically driven ("automated") tagging (mark-ups); 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.

- not historians but software as archaeologist listening 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 cultural 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 neglecting the vocal micro-timings and the one-stringed Gusle instrument that was integral to the performance. Reverberative memory can only be 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; perspective 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

- Sónia Matos on the archival potentials of a purely sonic language in danger of extinction, 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; 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 transcription 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

NOTES ON GUSLARI ON-LINE

Listening to magnetic tape recordings

- Oberlin Smith, description of magnetic recording, in: *Electrical World*, Sep. 8, 1888, based on his visit to Edison's lab in 1878, using an electromagnet with a string covered with iron filings; may have built a working model but no device has survived = Internet "Magnetic Recording History"; sketch Oberlin Smith, in: *Electrical World*, September 8, 1888: spoken words are transformed by the telephone A into an electrical sound signal and are recorded in the form of magnetization patterns on the sound carrier C, passing through the recording head B. F = battery, E = take up reel, D = supply reel, J = reel brake"

- 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" = 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); Joseph Jastrow's experiments with visual ambiguity around 1900 (figure-ground-ambivalence as perceptual relais); 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 tending 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

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

- Alain Lomax' *Global Jukebox* project for "cantometric" analysis and comparison of "musical DNA"

- taking the visible image of grooves in a vinyl record literally, analyzing them as what they apparently are: wave forms

- museological perspective for Musée des Ondes Emile Berliner (former RCA records factory) in Montréal; conceptual focus present already in title: the wave-form; to pick up an essential of what is associated with "analog" media, both mechanical (the phonographic groove) and in terms of electro-magnetic waves (radio / television); the place then will develop reflection upon the relation between wave forms and quantized (techno-mathematical, "digital") sound events; would give the place an importance of media-epistemological dimension

- time shift; a couple of *guslari* performances for Parry's electro-mechanic aluminium phonograph (mid-1930s) re-recorded on Lord's electro-magnetic wire recorder around 1950; difference technology makes? Novi Pazar research trip in 2004, applying same Webster Chicago wire recorder; Alex Steyermark

The 78 Project movie, re-enacting Alan Lomax' recordings with equi-temporal machines

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, Milman Parry's 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

- Parry's phonographic recording apparatus disappeared long ago; once designed by Lincoln Thompson, founder of the Sound Specialties Company in Waterbury, Connecticut, interested in developing technologies for the sound cinema; supplied Parry with the motion picture camera used for the "Kino" = Kommunikation David Elmer, Kurator der Milman Parry Collection, Januar 2007

- paradox of "preserving the ephemeral" of oral poetry by transcription of phonographic recording (Parry / Lord, Bowles et al.); documentation by arbitrary, coded, discrete signs is symbolic, while signal recording captures it, 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 occurrence of the phonograph, the human voice and musical expression) generated rhetorical, symbolic and scriptural 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

- ethnomusical recordings taken by the ethnologist Selenka in 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 = <http://www.gfai.de/deutsch/projekte/bildverarbeitung-industrielle-anwendungen-projekte/spubito.html>, accessed November 4th, 2013

- irritation of the temporality of cultural memory with phonographic 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 change in historical time; media-inherent temporality differing from the established notions of cultural history

- digital processing of analogue recordings just another technical extension or does it transform the very essence of oral poetry? 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 before

- notational writing (the vocal alphabet, musical notes) challenged by analog recording technologies like phonography, magnetic tape; in 21st century, symbolic notation has re-entered: alphanumeric code within computing

Transcription versus technical recording

- "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, 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"

- 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; 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")

- around 1820, the *Darmsaiten* in Manchester 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; Tomaszuk on *metal* string

- in media-archaeological sense reading 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

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

- musical notation, as very time-invariant code, „saves“ (and at same time deprives) sonic signals from its temporal ephemerality: sonic articulation is ephemeral and time-based and self-annihilating by definition; Hegel: tone /

transition; Isidor from Sevilla (died 630): „Nisi enim ab homine memoria teneantur soni, pereant, quia scribi non possunt“ = as quoted in 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

- media-ontological difference between analog signal inscription (phonograph) and the electro-magnetic signal (wireless radio and magnetophonic recording) - instead of having it just as two subsequent phases in the history of technology: "Wireless embodied the core values of Tesla's model of invention: ubiquitous transmissions, disembodied presence, and simultaneity. If the dominant paradigm of invention epitomized by Edison was one of textual remediation, time-biased inscription, and permanent representation, Tesla's was one of oral remediation, space-biased transmission, and ephemeral presence" = Ghislain Thibault, *The Automatization of Nikola Tesla: Thinking Invention in the Late Nineteenth Century*, in: *Configurations*, Volume 21, Number 1, Winter 2013, pp. 27-52 (52); https://www.academia.edu/6320470/The_Automatization_of_Nikola_Tesla_Thinking_Invention_in_the_Late_Nineteenth_Century

- radio waves (until today's wireless LANs) "spectral" presence in a precise and metaphorical sense. Electromagnetic waves are inaudible to human ears and visible only in its small spectrum perceived as "light"; the immateriality of voice transmission by radio waves makes is a ghostly presence. Since mid-19th century the electric conductance of gas flames had been known, "and early wireless experimenters had noticed that this conductivity was affected by the presence of radio waves" = entry "Audion" to <http://en.wikipedia.org>, accessed February 2014

- 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

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 *undead*: 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); add it to the *Problems* like with the stripes of punched Morse code for the first edition. Just like the piece of punched Morse code might be now re-inserted into a reading mechanism which can decipher the latent message, the piece of wire most probably magnetically stores a voice or piece of music (in fact, 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; not "dead media", but: media *undead*; an untimeliness of media incorporated here

Technical recording vs. symbolic transcription

- 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 coughing. Thus media-archaeology uncovers a *mémoire involontaire* of past acoustic, not intended for tradition - a noisy memory, unaccessible 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

- *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 Parry's 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, 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

- 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

- applying electro-magnetic and digital filter operations, Fourier-analysis, oscillo- and sonography to recorded songs, since they have not only been translated / transcribed into elementary discrete symbols (the musical score, the textual alphabet), but endured as signals in the electro-magnetic field which is waves (like sound), giving access to a micro-world of technologies of culture

- Parry's apparatus long ago disappeared; designed by Lincoln Thompson, a graduate of the Worcester Polytechnic Institute and founder of the Sound Specialties Company in Waterbury, Connecticut, provided Parry with a direct cutting aluminium disc phonograph with two drives; supplied Parry with the motion picture camera used for the "Kino" because of interest in developing technologies for the sound cinema (information David Elmer, January 2007)

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

- 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 assistance to the embodiment of the formulae)

- Lord's re-recording on Wire Recorder 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 probabilistic mathematics (Maxwell), closer to radio (Hertz) than to writing

- subject the recordings to Fourier analysis of acoustic spectra performed by highly sensitive oscillographic and digital measuring devices; switch to another mode of observation which is not fixed on 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); in Assembly? re-engineering

- 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; identify the program code and re-engineer the automated search, against the handwritten remarks (kind of computer philology); "rhythmic" pattern woven by the printout with the spacing

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

- explicitly opposed to "notebook-orientated scholars" = 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); that is: to transcription of sound into the symbolic regime of musical scores and alphabetic description, Alan Lomax used mechanic and electronic recording devices of acoustic signals to catch folk 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 scene. 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., *Choreometrics*: 27; Denis Gabor's creation of "acoustic quanta *via* film projector

NOTES ON PHONETIC ANALYTICS

Case study: "Lautarchiv", Humboldt University

- Paul Wendeler, in mid-1880s, as a student of medicine at the University of Kiel, set out to obtain, for his dissertation, visual records of the sound waves corresponding to consonants; applied a modified phonautograph (Kopplung von Metronom und Stimmgabel) called the "Sprachzeichner" (or "speech-depicter") designed by his mentor, Victor Hensen (physiology)

- 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 *analytics* expressed by spectographs for audio content - a dramatic shift of emphasis from the symbolical textual field to the processing of the real audio signals; voices identified by their very spectral individuality, not subjected to alphabetic registration in written metadata; a signal memory arises from the phonographic record

- media-historiographically canonized „first“ technical, not just symbolical recording of a human voice (children song „Mary had a little lamb“) resulting

from the experiment of Thomas Alva Edison with the tinfoil phonograph in 1877; primary scene *re-enacted* by the elderly inventor (Edison) himself, 30 years later by his same / different voice for a sound film. While the recorded signal principally stays invariant over time, the body from which the song originated apparently has aged, being strictly subjected to what is called historical time; Beckett's drama *Krapp's Last Tape* (1958)

- to convince the audience of the sonic fidelity of phonographic recording, Edison Company in 1916 arranged for an experimental setting in the New York Carnegie Hall: "Alone on the vast stage there stood a mahogany 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" = "Edison Snares Soul of Music", in: New York Tribune, 29. April 1916, 3

- parallel staging of human vocal performance *versus* apparatusive acoustic operativity 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 America 1877-1925*, in: *The Musical Quarterly* 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

- "Siren" songs better understood by radio receivers; the revived interest in the acoustic authenticity of the Siren motive in Homer's *Odyssee* re-arose within radio culture, which for the first time made the voice not only symbolically (alphabet) but actually transmissible as signal

- 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 pickups)

- on the linguistic field that the first computational algorithms for voice recognition have been developed - as "Umwandlung der physikalisch meßbaren Schwingungsverläufe von Sprachsignalen in elektrische Impulssignale" = H. Schnelle, Automatische Sprachlauterkennung, in: Kybernetische Maschinen. Prinzip und Anwendung der automatischen Nachrichtenverarbeitung, Frankfurt/ M. (S. Fischer) 1964, 208-219 (208)

- key operation of time-signal-to-frequency transformation: "Schwingungen können durch Folgen von Zahlen repräsentiert werden" = Schnelle 1964: 211; sonicity not reduced to the dynamics of waveforms, but encompasses mathematical operations (and their computing machinic embodiments) as well. "Lautsprachliche Merkmale" (Schnelle) can be differentiated into *vokalisches*, *stimmhaft*, *sonant*, *(ex-)plosiv*, *geräuschhaft* = Schnelle 1964: 210; esp. Fig. 1 "Schematische Darstellung der Signalverarbeitung zur Erkennung des Merkmalpaares stimmhaft/stimmlos", in: Schnelle 1964: 213

- target of sonic analytics not speech as semantic content in the hermeneutic sense, but the very materiality of such articulation: the phonetic "Laut" (*phoné*); 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

- "Tones can be made visible. The oscilloscope, through electrical processes, transforms vibrations of the air into a picture that appears on an illuminated screen. It is the picture of a wave line. [...] An experienced observer can accurately read the acoustical qualities of the tone from the outline of the curve. [...] 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 steps, into vibrations of a 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 multiplicity [...]. [...] in our / hearing, this single visible line becomes a combination of lines exhibiting vertical and horizontal relations of the highest complexity [...]. 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 mathematician a considerable expenditure of time and energy" = 1956: 333 f. -

until Fast Fourier Transform arrived in digital real-time computing

- techno-metrical analysis of phonic 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

"dictaphone"

- Isaac Pitman, *Phonography, or, Writing by Sound; Being a Natural Method of Writing, Applicable to all Languages, and a Complete System of Shorthand*, London (Bagster & Sons) 1840

- voice on dictaphone still the human speaker's voice? Does one recognize the bodily source when listening to this audio recording like the dog Nipper once's recognized "His Master's Voice" from gramophone? different from using the dictaphone "function" as "App" on a smartphone, rather enact a recording on a real analog dictaphone; recorded voice audibly gets 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 an Internet website, this recording has to be sampled and compressed into a digital data format which claims to be invariant towards temporal change); dis-embodied voice recording tells as much about the technological biography of the dictaphone itself; eventually subject to forensic speech recognition to authorize the recording and recorder

- tecno-sonicity (differentiate it from acoustic sound as *Klang*) referring to the medium message of sonic articulation, which in techno-mathematical media is the unfolding of (at least partially) periodic time signals (electro-magnetic vibrations, digital pulses); temporal isomorphism between phenomenal sound and media-inherent dynamics

Lautarchiv *analytics*

- "Schematische Darstellung der Signalverarbeitung zur Erkennung des Merkmalpaars 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 = Ferdinand Trendelenburg, *Klänge und Geräusche. Methoden und Ergebnisse der Klangforschung, Schallwahrnehmung, grundlegende Fragen der*

Klangübertragung, Berlin (Julius Springer) 1935, 51; 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 being 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) = 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.; list of the both phonographically and symbolically registered recordings provided online: <http://www.sammlungen.hu-berlin.de/sammlungen/78>

- 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; wakening it up does not necessarily mean to transfer it into a public museum; activating the store (respectively the data bank) today rather means transforming it into an informatinal space; digital "archive" absorbing all previous media - not materially, but as formats = Kittler 2007: 113

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

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; not single sound files revealed, but relations within sound bits within, a *diagrammatic* sonic archive

- Kurenniemi's cassette tapes (Philipps-Recorder); analysis of digitized audio-Inhalte with Spectrum sort algorithm (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* referring to search algorithms as well: sonic analytics; algorithmic ("automated") tagging (mark-up), kind of endo- rather than metadata from

within the medium; oppose / combine with "social tagging" which is non-taxonomic in similar ways; hybrid (non-)classification

- algorithmically / automatically tagging "silence" (intentional and non-intentional one); "analysis"-tool under sound editing software Audacity: "Silence Finder"; "Effects" option: "Remove Silence"; further: "Echo"; "Beat Finder"; frequency analysis (choice of sampling rates)

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

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

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

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

- Erkki Kurenniemi - 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 a rigid archival / institutional backbone on the one side, and stopping making pre-figured sense by classification on the other, in favour of stochastic, Markov-chain based retrieval

- 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; "logbook" including Constant's probes into the archive, sample visual data, allowing for interaction with the *data radio*

- multiple correlations *versus* fixed taxonomy; thus: not single sound files are being revealed, but relations between sound bits from within, a *diagrammatic* sonic archive

- algorithmic analysis 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 reveal its technological conditions: "a software-machine, as readable, writeable and executable", in an effort to let the material "'speak' for - itself" = Geoff Cox / Nicolas Malevè and Michael Murtaugh, *Archiving the Data-body: human and nonhuman agency in the documents of Kurenniemi*; *body_human_and_nonhuman_agency_in_the_documents_of_Kurenniemi*, accessed July 15, 2014,, published in: *Un-writing Art History xxx*, MIT Press 2015 - which matches, in the digital regime, nineteenth century "analog" enthusiasm of early photography as indexical "self-registration" of nature, or the kymograph as self-registering sonic signals, to archive-based writing of history); beyond traditional historicism: navigating audio-visual data (once sampled into bits and bytes) from *within*, that is: truly media-archaeologically, suspended from metadata

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

- deriving new insights from Finnish artist-engineer Erkki Kurenniemi's audio-cassette-diaries from the 1970s by means of the "active archive", Constant developed a "Spectrum Sort" tool; 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; audio file digitized in samples of 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 highest frequency bands. Thereby the moments when Kurenniemi does not dictate speech any more but occasionally starts singing can be identified immediately from the massive amount of his cassette tapes

NOTES ON SIRENIC ARTICULATIONS

Locating the Sirens

- the option of a genuine sonic approach to mapping, which turns the "map" into a dynamic event, suspended from the dominance of visualization which most people associate = Peter McMurray, *Ephemeral cartography: on mapping sound* media archaeological reading of soundmapping, in: *Sound Studies (online)* 2019, beginning with the sirens at Li Galli; in mathematics and informatics, "mapping" any point-to-point relation, suspended from the human sensual modalities at all; Kittler's interpretation inviting for a more literal reading of Homer's lines and the bodily Sirens, while the more media-archaeologically inclined members of the 2004 expedition team took a strictly signal- or data-driven approach, measuring the acoustic properties of the LiGalli island setting, identifying some "singularities" on the basis of signal response time etc.; this almost scientific evidence was then matched with

knowledge about how archaic Greek ears were musically tuned = Martin Carlé, xxx, now developing a software tool for computationally re-enacting Aristoxenos' musical theory; combined positivist-cultural approach

Recording in wax

- wax cylinder an essential recording medium; according to Descartes and Fritz Heider, it provides a loose coupling of elements, on which a tight sonic "form" can be phonographically impressed - in/formation

- 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 wax 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 surface 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 receiving impressions. 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 this is precisely the way in which [...] our mental apparatus performs its perceptual function." = Sigmund Freud, *A Note upon the 'Mystic Writing Pad'*, 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 Gregory Benford's Science Fiction novel *Time Shards*

- Platonic dialogue *Theaetetus* (§ 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 rings; [...] but whatever is rubbed out or cannot be imprinted we forget and do not know."

- "[...] 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 l'inhumanité de tout chant humain" = Maurice Blanchot, *Le livre à venir*, chap. I "Le chant des Sirènes", section "La Rencontre de l'Imaginaire", 9-18 (10); Blanchot taking into account the notion of human singing turned upside down: "Some have said that it 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 inhumanity of all human singing" = Maurice Blanchot, *The Sirens's Song. Selected Essays*, Bloomington (Indiana University Press) 1982, 59-65 (59)

- Barbara Engh, referring to Theodor W. Adorno's writings on phonographic recording, accentuating the extent to which the Sirenic singing is not human; "wherein the more perfectly the machine is able to represent the human, the more thoroughly is the human removed" = 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) - or, rather, discovered; 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" = Engh 1994: 134

- a "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" = Winthrop-Young, Siren recursions, in: xxx

- (a)historic dilemma: How can an acoustic event which is supposed to have happened before the age of gramophonic recording be verified? Testing and reconstructing such acoustic events by media-archaeological means is a sound analytical provocation to classic philology.

- 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 knowing it is reproduced from dead signals on a storage medium - and even more with electronic sound processing; mythic Sirens address the non-human side of technical media; the fact that technical media are media of non-solid, non-phenomenological worlds (electro-magnetic fields, high-level mathematics, speeds beyond human comprehension" = chapter: Non-human media, in: Jussi Parikka, What is Media Archaeology?, Cambridge / Cambridge, Mass. (Polity Press) 2012, 55-61 (62) - which, beyond the phonograph, is true for electronic sound media up to the digital sound processing of today with "ultra-sonic" speed of processing

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

- Since the nineteenth-century, Sirens became a term for a technical vowel sound generator, i. e. a signalling device, "subsequently playing a key part in the mapping of the thresholds of hearing" = 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); inverse re-occurrence of the mythic Sirens not within cultural 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. 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

- 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 machine 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 discovered in culture. Geoffrey Winthrop-Young points out the special twist of this forensic Siren analysis: "[...] one of the sound-producing devices used to disconcert 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.

- path of direct and reflected sound from source to listener with corresponding time delays for a sound impulse; Leo Beranek, *Music, Acoustic, and Architecture*, 1988

- experimental settings: two real opera singers on the Li Galli islands; transmission of monk seal articulations which have long gone, and the electro-acoustic sampling of noises (bees, waves, wind) which might sum up to Siren songs when beamed against the rocks of the twin islands; what is inscribed in Homer's *Odyssey* is not just poetic invention, but cultural-technological knowledge

- S/sirens: 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" = Winthrop-Young, op. cit., note 5; such a procedure 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 a truly technological 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" = *ibid.*, 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; only 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

- in terms of cultural techniques, the phonetic alphabet as condition for such an awareness; mythological Sirens 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 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

- Walter Benjamin in section XIV of his essay on *The Work of Art in the Age of Mechanical Reproduction*; there are "critical epochs in which a certain art form aspires to effects which could be fully obtained only with a changed technical standard" = Walter Benjamin, *Illuminations. Essays and Reflection*, ed. by Hannah Arendt, New York (Schocken) 1968, 237; 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.

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

- 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 Assembly language); electronic Harmonizer in acoustic synthesizing transposing male into female voice *vice versa*; Springer Tempophon time-stretching allows to transpose audio without changing it's length, similar to Variphase technology from Roland; info in German on: sequencer.de; cp. Gabor's cinematographical quantizing sound

- to arrive at "non-Pythagorean sound" (term coined by Johannes Kroier, Berlin) 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 plays a crucial role. It was with the invention of the electric telephone and the vacuum tube-based, thus amplifying loudspeaker that previously non-acoustic phenomena (such as small electric currents in human nerves) could be sonified in physiology and other branches of science; so-called "cultures of listening" and techniques of

sonification which have emerged within cultural studies in recent years 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 rarely been existent to cultural consciousness though it was co-present in any articulation

- *listening* to 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 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 electronic devices is appropriately called *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) not to be historicized at all, since they do not exist as historical but diagrammatic records = Axel Volmar, *Gespitzte Ohren. Akroamatische Dispositive und musikalisches Wissen als Grundlage für eine Geschichte epistemogener Klänge*, in: *MusikTheorie. Zeitschrift für Musikwissenschaft*, vol. 22 (2007), no 4 (thematic issue: *Peri mousikè epistéme. Zur Aktualität des antiken griechischen Wissens von der Musik*, edited by Sebastian Klotz), 365-376 (366); best method to understand a medium 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; monochord a time-machine in a different sense: It grants participation at the original discovery of musical knowledge, since - the techno-original experience is repeatable; the re-enacted experiment allows for communication across the cultural-historical gap by providing a storage-channel; reverberating chord is an operative sonic media diagram. Charles Sanders Peirce describing diagrammatic reasoning: "[...] similar experiments performed upon any diagram constructed to the same precept would have the same results" = Charles S. Peirce, *The New Elements of Mathematics*, vol. IV: *Mathematical Philosophy*, The Hague / Paris (Mouton) / Atlantic Highlands, N. J. (Humanities Press) 1976, 48; human senses, once coupled with a technological (especially sonic) setting, 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 exception: 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.

Archeo-acoustic phonautography? *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" = www.zalea.org/article.php3?id_article=496)

- 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)

- sonifying the grooves in ancient Roman poettery by phonographic pick-up (typo "pottery / poetry"; oral poetry audible again from ceramic shards; Gregory Benford's short story *Time Shards*); converting the grooves of Roman vases borrowed from Archaeology Department by gramophonic sampling into analog and digital signals, trying by software-based signal-to-noise analysis to separate any trace of phonetic articulation from the scratch of the material; due to signal-to-noise ratio no exciting results so far. Heckl advises to apply much more sensitivise measuring instruments / filter algorithms to carry on the experiment

- archeo-acoustic hypothesis: sound inadvertently recorded before the phonographic developments of Scott and Edison; unfavoruable signal-to-noise ratio, though; first of all, such media archaeology remains technologically close to the signal (including the physical or mathematical "veto"); only on that basis epistemological speculation shall start

- about accidental recordings or archeo-acoustics: "[...] my view is rather negative on this idea. Sound evolves over a timescale measured in milliseconds, if not less. In order to record sound people had to find media which could a) be deformed in response to sound on that time scale, and then b) which would hold that deformation stable for periods exceedingly long (years, centuries)" = communication Carl Haber, October 2012; functional materials soot on paper (Scott), tinfoil (Edison), and wax (Bell and Tainter), later lacquer, plastic, and special soft aluminum which could be embossed. "In archeo-acoustics people instead focus on soft 'paste' like materials such as clay and ink. In these cases the materials will flow if disturbed, under gravity or density gradients and eventually seek their own level in equilibrium. Any effect from sound will be erased or severely attenuated. Furthermore any simple transducer, such as a needle or stylus, will itself couple very poorly to the

sound pressure field in the room so not transfer energy in an efficient way. This is why Scott and the rest later all used horns as well. The archeo-acoustic mechanisms lack such an impedance match as well" = Haber ibid.

Siren songs

- contrary to Walter Benjamin's anecdote of the dwarf within the mechanical chess-player, media archaeology referring 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

- reverse phonography as acoustic media-archaeology; experimentally realistic by the options of quantum microscopic reading of atomic surfaces; Gregory 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 manual 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" = *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

- discrete pulses, acoustic signal processing, resulting in an instrumental siren, developed by Charles Cagniard 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 it 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"

NOTES ON ARTIFICIAL VOICES

The Vocoder

- advanced speech security system developed by Alan Turing in the Second World War, "Delilah"
- voice scrambling capabilities of the vocoder, known for its role in the history of electronic music rather than for its cryptologic potential
- SIGSALY 1943: matched pair of one-time-use vinyl records of random thermal noise, played synchronously. Sender: wrap spoken message in noise; receiver: filter
- Turing's *Delilah* for discrete voice encryption
- Aleksandr Solzhenitsyn on his development 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 processing the input speech through a series of bandpass filters, measuring the amount of energy in each band, and sending "analysed" signals as information, i. e. encoded; captures spectral information of the voice; receiver approximates it to the original voice
- Derek Holzer: <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 Kempelen 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 by electronic units: noise generator for voiceless phonemes 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: synthesises 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" = Jacques Lacan, *The Seminar of Jacques Lacan, Book II: The Ego in Freud's Theory and in the Technique of Psychoanalysis, 1954 – 1955*, New York (Norton) 1991, 54, as quoted in Mills 2010: 36
- the act of hearing (within the human ears mechanism) *already* an analysis of the perceived sound waves into discrete impulses which become the impression of voice only by brain action (Hermann von Helmholtz insists)
- Dudley's "vocoder" different from the simple "voder"; voice became evident "comme diagramme du corps" (Catherine Paoletti) in the moment of spectrographic analysis
- with phonography not the symbolic order (music) was recordable but the sonicity of the oral poetry event: the acoustic signal, the micro-temporal 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: 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
- museological *Wunderkammer* premise indifferent to the ontologically emphatic distinction between art and nature, human and machine, live and animation, logocentric presence and technical re-presencing (phonographic voices / synthesized sound)
- specific escalation of the "sonic Wunderkammer", no more dichotomy between natural and unnatural voices
- voices from tele-communication devices: irritations of "presence" / the present as the equivalent of the visual / material Wunderkammer in the temporal domain of subjective time experience
- man most human when communicating in singing and speech, as defined by Aristotle and Wilhelm von Humboldt, *Über Denken und Sprechen* [MS 1995/96], in: W. v. H.I., *Werke*, ed. Albert Leitzmann, vol. 7,2, Berlin 1907 (reprint: Berlin (de Gruyter) 1968; man becomes inhuman if he can not tell the natural voice from the 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" = Jonathan Goldberg, *Voice Terminal Echo. Postmodernism and English Renaissance Texts*, New York / London 1986, 1; 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.*
- analogue telephony transduction of mechanical vibrations to voltage variations; 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) confronting 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 Dudley's "vocoder" different from the simple "voder"). "Homer" Dudley's "Christian name" allows for a combinatorial reminder: The vocal alphabet - the adding of single letters to express single vowels AEIOU has been a "technological" (Ong) modification of the Phoenician syllable alphabet - has been invented to write down HOMER's oral poetry in a quasi-phonographic way, to preserve the vocalicity of its articulation - grammo-phonics 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: 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, produced until the late 1960s; cp. Speak-and-Spell kit

"Frozen" voices

- printed texts necessarily excluding sound matter - even if, in a deeper sense, there is implicit sonicity in diagrams and graphs that are derived from sound sources. Media-archaeological purism resists the seduction to use substitute imagery instead; to what degree a sonagram (spectrum analysis) or sonogram (ultrasound-based visualization) keeps an indexical relation to the measured

event; technologies to visualise sound and the human voice (in terms of signal recording and its spectrographical analysis); Mara Mills, Deaf Jam. From *Inscription to Reproduction to Information*, in: *Social Text* 102, vol. 28, No. 1 (Spring 2010), 35-58

"Harmonizing" voices by sampling

- phonograph, gramophone and magnetic recording "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

- media-archaeological, that is: techno-mathematical approach in the electronic synthesis of the human voice, a coupling of materially refined electronics (*techné*) and mathematical analysis (*lógos*)

- truly techno-epistemic approach to modeling the human voice not imitating 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" = 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; mathematical approach and "graphic sound" of a non-metaphorical kind - sonagrams as the diagrammatic 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 = 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; Yankovsky treating 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

- 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 cognitive "cooling" (McLuhan) by analysis: "The final waveform would sound like a 'frozen' vowel" = Smirnov 2012: 215, referring to Boris Yankovsky's "Theory and Practice of Graphical Sound"

- computing 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 the mathematical transformation of a temporal function or sequence of signals into a spectrogram; 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, 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

Voicing Artificial Intelligence: speech machine learning

- Teuvo Kohonen's 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 similarity-based dis/order, as applied to Friedrich Kittler's voice itself: [Audio] kittler-kov-Carle.mp3

- logocentric "content" of AI voices phonetic; its actual message (McLuhan) articulating algorithmic "postlogos" (Striano)

- overall orientation (or phenomenological "intentionality") of Deep Learning still anthropocentric, oriented at computational emulation of how *humans* communicate - kind of "imitation game" (Turing) or more sophisticated ELIZA (Weizenbaum). Only with machines emulating machines (AlphaZeroGo vs. AlphaGo), a "postlogos"¹ emerges.

1 Schäfer op. cit., 74

A different kind of recording: The phonographic un-archive

- with the refinement of the Phoenician alphabet to the Greek phonetic alphabet (which Ong actually called a "technologizing" of the word), acoustic articulation (speech, singing, oral poetry) symbolically recordable for re-play; presence-generating power of technically recorded voices differing 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" = Friedrich Kittler, *Gramophone - Film - Typewriter*, Stanford (UP) 1999, 5
- sound and speech 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" = Kittler 1999: 15 f.
- *digital* audio recording *integrating* 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 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) still symbolic recording; phonograph registering 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; not just providing 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)
- musical scores usually ending 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" = Theodor W. Adorno, *Zu einer Theorie der musikalischen Reproduktion*, Frankfurt / M. (Suhrkamp) 2001, as quoted by G. Mazzola, *Musical performance*. Springer, Heidelberg 2010

- with the phonograph, hearing became attentive of all kinds of sounds, regardless of their source, quality and meaning(lessness), just like the inner ear impassionately transduces vibrations analogue to electro-mechanical sound reproduction = Sterne 2003: 33; listening became ahistorical, subject to the time-invariant reproducibility of acoustic signals; a tone exists only in transience, that is: as Husserlean "time-object"

- technical media archaeologists themselves: 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

Phonographic remembrance from noise

- "Hearing the cracks and noises of a phonograph recording may initially enlighten their historical status as 'mechanical' instruments" = Karin Bijsterveld, *Mechanical Sound. Technology, culture, and Public Problems of Noise in the Twentieth Century*, Cambridge, Mass. / London (The MIT Press) 2008, 26; in terms of the mathematical theory of communication (Shannon 1948), such cracks belonging to the kind of "noise" introduced by the channel of transmission itself which is here: the channel called time

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

- "Listening to Technology" = Bijsterveld 2008, chap. 1, as *close listening* to the technological artefact itself. The Museum of Endangered Sounds takes care of the sound of "dead media" = Website „Museum of Endangered Sounds“, *online* <http://savethesounds.info>; Technical Committee of IASA in its recommendations from December 2005 insisting 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 significantly filtered; "quantizing noise" on the very bit-critical (technical) level of signal sampling instead

NOTES ON SONO-TRAUMATIC MEMORY

Technological de-humanizing of oral testimony

- 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 technology 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 even more sub-traumatically irritating to the senses (case audio CD)

"Bad recording" of beautiful voices

- obsolete *Conquest of Space* record with communication by cosmonaut Gagarin to Moscow, basis for electro-acoustical composition by Nick Fells; is it exactly its non-archival quality which makes "bad recordings" exciting for media archaeology. the recording medium articulates itself and does not simply transport cultural content; cp. a recording of Donizetti's Lucia di Lammermoor as performed in the Milano Scala in 1954. After some while, somewhat like out of space, a radio transmission interference happens. This is the noise from which media-archaeological theories derive.

- 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 Donizetti's *Lucia di Lammermoor*, recording Scala Milano, 1954 under Karajan. In the midst a radio signal interferes with the concert recording itself.

- Callas' voice rivaling 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

- controlling noise by mis-interpreting it as communication; in the electronic media age, the medium to speak with the dead is not texts any more, not literature, but radio; tuning of a radio in search not only for channels but for the inbetween of channels (the noise interstitial spaces) functions only with analog radio sets, with an „elastic“ scale

- against "noiseless" digital aesthetics, electronic analog media still know what noise is; radio jamming interpreted by the human ear (which immediately, as cognition, strives to make 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“

Martin Heidegger's radio

- for his hut in Todtnauberg, Heidegger acquiring a radio on the climax of the Cuba crisis in 1962 for the global fear a world war might actually break out. In spite of Heidegger's critical remarks on the implications of radio, he submitted to the medium exactly at the place which seems to be the remotest from all technology (otherwise, there was just one electric bulb in the hut). Heidegger's son actually gave me the exact type number of this radio; the Media Archaeological Fundus acquired a radio set from the same series which now is stored in the media-archaeological collection at Humboldt University; concrete medium archaeology extending within the frame of questioning media temporality

"Radio silence"

- mid August 2014, an apology *via* e-mail (notably from the editors of the *online* journal Mnemoscape): "I do apologize for the prolonged radio silence." Wörtlich genommen, in terms of radio as electro-magnetic event, the carrier frequency communicates even if there is no modulated signal to be detected (technically: demodulated) and thereby to be transduced to the human ears. Semiotically "empty" radio is still a pure message of the medium (just as McLuhan defined electric light, in the first chapter of *Understanding Media*). If sound is bound to the audible, it belongs to phenomenology: "Phenomenology is a logos (a discourse) of the phenomena (the things that are visible)" = Paddy Scannell, *Television and the meaning of live. An enquiry into the human situation*, Cambridge (Polity Press) 2014, 5 - or audible. "It is distinct from and in opposition to what we might call noumenology - the logos of the noumena: the invisible things, the things that belong to nous (the mind, consciousness, logos itself)" - which is the symbolic regime (alphanumeric codes) = Scannell 2014: 5; inbetween sonicity: time-signals which happen, even if they are not phenomenologically audible

- 2014 international conference organized by Czech Radio on the topic *Stream and Form – Two Options and Two Strategies of Public Radio Broadcast*; transformation of current media (radio and television) tempor(e)alities; how radio's proper "shaping of time" changes a) with the transformation from hardware-based proper radio technology to Internet-based radio as a data format among others (what is lost when radio is not an independent media technology of its own engineering rules any more but becomes a function of general computing), and b) how does the online aesthetics of immediate access challenge the traditional form(at) of "edited" time in radio broadcasting; radio thereby losing its distinctive qualities as an independent technology and becomes subjected by the real-time economy of Internet time

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 loses 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" = Peter Price, *Resonance. Philosophy for Sonic Art*, New York / Dresden (Atropos Press) 2011, 85; central aspect of "Digital Humanities" addressed thereby

- "traumatic" moment in analog media testimony resulting from the phonographic presence of the voice in re-play; photographic *punctum* as identified by Roland Barthes; Markos Hadjioannou, *From Light to Byte. Toward an Ethics of Digital Cinema*, Minneapolis: Univ. of Minnesota Press, 2012, esp. 50 ff. on Alain Resnais' documentary film *Night & Fog* from 1955) and the indexial trace of light in electronic video; 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 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 sequence 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; 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 yet to be digested in occidental cultural epistemology and logocentrism; 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 from the technological re-conditioning of temporal experience itself

- 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 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

- cybernetic machines exhausting the smallest interval (Max Bense)

- "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

- Norwegian composer Christian Blom creating 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; 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-located 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?); 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 devotions are no longer founded upon a particular [...] practice of phonetic alphabetization and the concomitant 'hearing' or the silently read biblical passage as a divine voice within the 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