TECHNO-DRAMA / TECHNO-TRAUMA. Inbetween theatre as cultural form and true Media Theatre

[Extended pre-version for keynote lecture at *Beckett and the Media* conference, Mariastein, March 23-25, 2018]

Introducing Samuel Beckett's media theater

It takes sound philology and archival research to contextualize Beckett's oeuvre in his contemporary media culture, while at the same time a radically media-archaeological reading of a one-act drama like *Krapp's Last Tape* (KLT)[1] discovers a different micro-dramatic emergence *from within* the media-technological sphere of magnetophony (its "sonicity").

A non-historicist reading of KLT does not circle around the rigid denominator "Beckett" and the idiosyncracies of an individual author but understands KLT as the instanciation of a more fundamental *drama* which is the sometimes neurotic with Krapp, after a moment of "musing" in front of the magnetophone, tearing the tape spaghetti out and throwing the tape away), even techno-traumatic excesses resulting from positive / negative feedback coupling of human memory with machine storage (Wolf Kittler 1991).

In *Krapp's Last Tape* (1958 Samuel Beckett), the human actor Krapp experiences a trauma when listening to the technically preserved voice of his former self. Already the Edison phonograph resulted in a shock within the cultural unconscious, since (as has been defined by G. W. F. Hegel) the "tone" (including the voice) had - phonocentristically - been the most volatile and present-dependent form of communicative articulation. All of the sudden, this very uniqueness could be technically repeated.

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[1] Samuel Beckett, Krapp's Last Tape and Embers, London (Faber & Faber) 1958; republished 1965

From the medium-specific operativity and technological *Eigenzeit* of the magnetophone stems a techno-traumatic affect. The reiterabillity of the human voice from recording media even beyond their bodily death has been a chock experience in terms of phenomenology. Such a traumatic temporality stems from the medium itself, its real message (in McLuhan's sense) or rather: the "real" (Lacan / Kittler) as technological message - as "an experience that is registered without being processed or experienced in the full sense"[2].

In the case of KLT, Krapp's disembodied voice is dislocated from the symbolic (traditional diary) into the real of the voice-recording machine itself (magnetophone), resulting in a *techno*-traumatic irritation.

There is a specific tempor(e)ality / tempORALity / tempAURAlity in the human voice when recorded on magnetic tape. Electro-technological media inscribe the voice into cultural memory by signals instead of symbols. Whereas alphabetic recording of speech looses the *hic et nunc* of the event[3], technical voice recording preserves the presence-generating power of signal replay.

The specific characteristic of *aura* as defined by Walter Benjamin depends on the impression of its being "here and now"; echoed by technological temp*aura*lity and specifically its sonic articulations culminating in the archetypal articulation of human presence, the voice and its media-temp*aura*lity; the specifity of media-aurality[4]

From this perspective the KLT play's essential issues are the attempt to receive authentic remembrance from technically evacuated memory and the techno-trauma caused by disembodied voices. In that sense the tape recorder is – although it is nonhuman – the second and equally important actor on stage. Therefore Krapp's Last Tape counts as genuine media theatre.

The co-presence of a human actor and a tape recorder in KLT, in technical terms, is a loose *coupling* which constitutes a comprehensive *system* - a cybernetic concept which has been the dominant *epistmé* when Beckett wrote his play.

This extends to the temporal dimension as well. One a human is coupled to a signal storage and processing media interface, is becomes subjects to the apparative temporalities.

Different from the theatrical stage which can only reveals the phenomenological effects induced by technologies, media theatre is not simply performed by human actors (like Krapp) enhanced *with* media; the real micro-drama rather unfolds *within* analog (signal circuits) and digital

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[2] Brand 2009: 198

[3] John Durham Peters, Witnessing, in: Paul Frosh / Amit Pinchevski (eds), Media witnessing. Testimony in the age of mass communication, Houndmills (Palgrave Macmillan) 2009, 23–41 (35)

[4] For a somewhat related use of that term, see Samuel Weber, Mass mediauras, xxx

("algorhythmic"[5]) technologies such as the magnetophone. There is signal transduction in analog electronic media, and signal processing in digital media.

The media-theatrical concept correlates with a different method of analysis. Apart from hermeneutic *exegesis* and *ekphrasis* of what has been written by Beckett in his script already, unfolding its different layers of meaning like in Bible studies, media archaeography rather identifies what escapes the script, assuming that the magnetophone knows more than its external author.

KLT insistantly unfolds the clash between the symbolic regime (language, writing, archival records) with the phono-technical real (Lacan, Friedrich Kittler). Three kind of agencies unfold: Human remembrance (Krapp) - symbolic memory order (ledger as tape inventory) - signal storage technology (magnetophone). Media-philological attention therefore reads KLT as an operational function of the epistemic challenge posed by the manipulations of tempor(e)alities by electro-acoustics around the 1950s / 1960s,

in an effort to resist philological extensions of literary genres projected upon the analysis of magnetic voice recording.

Instead of anthropocentric (human- and cultural performance-oriented) discourse analysis which focuses on the human modellizing of "memory" in terms of the respective storage technologies, and identifies the dramatization of electronic recording such as Beckett's KLT as a discursive symptom of technical "affordances", media archaeology more radically breaks out of the hermeneutic circle in favour of an analysis of the non-discursive techno-processual event itself.

"Media archaeologists [...] describe the non-discursive practices of the techno-cultural archive. Media phenomenologists [...] analyze how phenomena in various media appear to the human cognitive apparatus, that is, to the mind and senses."[6] While in the latter mode, any ekphrasis of the magnetic tape factor in KLT or in William Burrough's novel *The Ticket that Exploded*, tends to re-huamnize the techno-trauma by integrating it into the symbolic (historiographic) order of an anthropocentric narrative[7], media archaeography rather externalizes the technological challenge.

Archival research can be helpul in explaining the triggering of an operation. In the case of Beckett, the author had been asked, in 1956, to write a radio play for BBC, resulting in the broadcasting in 1957 of *All That Fall*. During production, BBC made a (at that time) new technology available to Beckett, the magnetophone, which allowed him acoustic monitoring and sonic control by playback. In terms of biographical narrative, this experience with functional

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[5]   See Shintaro Miyazaki, xxx

[6]   Kjetil Jakobsen, in chapter 6 of his text "Anarchival Society", discusses "Archaeology versus phenomenology", in: Eivind Røssaak (ed.), The Archive in Motion. New Conceptions of the Archive in Contemporary Thought and New Media Practices, Oslo (Novus) 2010, 127-154 (141)

[7]   Such as Michael Lommel, samuel Beckett. Synästhesie als Medienspiel, Munich (Fink) 2006

dramaturgy resulted in Beckett's integration of a magnetophone in the subsequent play KLT.[8]

Instead of philologically reconstructing the influences and steps on Beckett which successively resulted in the KLT play, media archaeological analysis starts from the factuality of the actual human-machine symbiosis as the core (of the) drama and replaces the author-centered hermeneutics by a technol-logical hermeneutics: What is the techno-epistemology which conditioned (*arché*) the possibility for Beckett to be dramatically seduced by the affordance of a magnetophone?

What happens when psychic "latency" becomes magnet signal recording? Not only is the configuration of a human protagonist (Krapp) and a hight-technological device (the magnetophone) a microsocial configuration in the sense of Actor-Network Theory or an *ensemble* in Simondon's sense, but the close coupling of human and machine on stage asks for a more rigorous analysis (in the Lacanean sense) of the cognitive, affective, even traumatic irritations induced in humans by the signal transducing machine.

Once the analytic focus is on the techno-phonic (and -logic) *medium* message of KLT, it becomes *inductive* in the precise sense of electro-magnetic induction which is the technological condition (the *arché*) of possibility of the drama unfolding in KLT at all. From the question whether Krapp's voice, once transduced into magnetic latency, is still human, arises the attempt to define the qualities of real *media theatre*.

The untimeliness of KLT

It has been frequently remaked in Beckett scholarship that in 1958 the technical temporality claimed in the play has been an anachronism, since the suggested 45 years of birthday tape recording by Krapp is a techno-historical impossibility, predating the actual development of the AEG tape recorder by decades. Therefore it was appropriate for Beckett to diegetically place the play "some time in the future" (introductory remark). But such time-shifting is the essence of spool-based tape recording and replay itself.

[But the future had already arrived. A more radical "schizophonic" (Schaefer) rupture between the human and his / her voice occurs with synthetic voices. While Beckett was still writing his drama KLT, Bell Laboratories in the US already experimented with the "vo(co)der", with artificial speech synthesis.]

Besides, the *arché-logos* of magnetic voice recording actually goes back to 1900 when Pouslen presented his "Telegraphon" at the Paris World Fare; with Oberlin Smith's circuit diagram, magnetic recording (explicitely targetted at speech dictation in office, and the telephonic answering machine rather than recording of music) even c-originated (as an electric answer) to the Edison

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[8]   An argument in John Fuegi, Brecht, Beckett und der Text im Zeitalter der Technologie, in: Knut Hickethier / Siegfried Zielinski (eds.), Medien/Kultur. Schnittstellen zwischen Medienwissenschaft, Medienpraxis und gesellschaftlicher Kommunikation, Berlin 1991, 356

phonograph. At that moment, another media-epistemologic gap opens: While the phonographic groove visibly still comforts the human bias to integrate the technical recording within the familiar cultural techniques of writing[9], the electric transduction of the acoustic voice into sublime field recording does not reveal itself immediately to the human sensory apparatus any more.

[Technical sound carriers do not just replace each other in the evolutionary course of technology. The phonograph respectively the gramophonic record on the on hand, the magnetic record on tape on the other, and finally the digital recording represent fundamentally different materialities and essences in terms of their technological registering of time-variant signals, time-based forms of reproduction and their function as time-channel in individual communication *alias* cultural tradition. In the case of phonography *versus* magnetophone, electronics makes a difference. The magnetic (audio) tape's logics diverges from phonographic linear inscription and rather connects to "non-linear cultural techniques (splicing, looping, dubbing)" and affording a "consistent interface with telephony, radio". In that sense, the tape acts "as counterpoint to the process of inscription at the foundation of the phonographic regime"[10].]

[The magnetic tape becomes an even more bizarre technological agency when we remember its origin from exeeriments with metal dust filters for cigarette paper in early 20th century Dresden by Fritz Pfleumer who actually called it "singing paper".]

Magnetic storage in *latency*, poses a rather traumatic challenge to the familiar cultural concepts of memory and recall, confronting it with a radically non-human eventality of storage. Here, all metaphorical comparions with Marcel Prousts *Recherche du Temps Perdu* (as practiced, e. g., in Lommel 2006) fail. The communication and memory technologies ("mediale Apparatur", Lommel 2006: 81) applied in Beckett's various works does not simply function as "supplement" and "prosthesis" of a reduced corporeal memory (Lommel ibid.), nor is it simply its "escalation" (Friedrich Kittler), but emerges in autonomous, rather chrono-(auto-)poietic techno-logics. Its circuitry and active electronics does not serve for any anthropological metaphor any more, if media-archaeologically confronted in its signal transducing potentials (instead of cultural re-familiarizing in literary studies).

[An initial irritation arises with Beckett's entry remark "A late evening in the future". To what degree can the 45 years of birthday tape recordings claimed in KLP be techno-historically pre-dated back from 1959? One the one hand, Pfleumer's "singing paper" only originated in the 1920s; Poulsen's wire-spool based Telegraphon, though, has been presented at the Paris World Fair 1900 as telephone call recording and answering machine.

[The magnetic wire-based telephonic voice recorder is not for memory but for a delayed present. The point transition from the present to the past is undefined.]

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[9] See Theodor W. Adorno on the "Schrift xxx", xxx"

[10] As expressed in "Tape: Or, Rewinding the Phonographic Regime" (3–24) by the editors of Twentieth-Century Music 14/1 (2017) special issue *Tape: Or, Rewinding the Phonographic Regime*, Andrea F. Bohlman and Peter McMurray, 8

[In 1820 Hans Christian Ørsted did not "invent" but rather *discovered* the electro-magnetic effect, which paved the way for Michael Faraday's experiments with electromagnetic induction in 1831, which ultimately lead to Oberlin Smith co-originary design of magnet recording almost contemporary to the Edison phonograph, and Valdemar Poulsen's magnetic recording on wire with his Telegraphon from 1898.]

On the other hand, "in the future" as seen from 1959, Krapp's magnetophone will already have been out-dated by the digital audio recorder. When staged at the present age of ubiquitous computing, a reel-to-reel tape recorder on stape appears "antiquated"[11]. But the computer was already contemporary to KLT in 1959, with its computational experimentation in "poetic" text generation by cybernetic informational aesthetics. With its "rewind" and "fast forward" buttons as the very affordance of the reel-to-reel tape recorder, the option of time-shifting is already suggested[12] - even to another technological media time.

In reverse, for circus artist Katja Nick the real time magnetic recording on stage, after pressing the rewind button, was a proof of her skill to speak backwards.

In media archaeological terms, there is no anachronism indeed with KLP. Magnetic voice recording on steel wire spools originated with Poulsen's *Telegraphon*, successfully presented at the Paris World Fair in 1900. The original description deserves a close reading since the real drama media-theatrically unfold here, anticipating all subsequent cultural aesthetisations. The "technical description" is a literary genre in itself: archaeography (dis-covering / un-writing) of technical essense, transforming it into verbal expression, thereby from electro-mechanics or electronics into techno-*logos*. By magnetizing a monochord-like wire with a passing electro-magnet in the rhythm of microphonically transduced alternating current of human speech, what remains on steel is "eine Art von magnetischer Wellenschrift", "eine dem Gespräch entsprechende sinusoidale Permanenz"[13] - with the human voice being transformed into a non-human time (resp. stporage) signal. In reverse replay, the technische system ("System") acts as resonyfier "wie eine elektromagnetische Maschine, deren Wechselströme im Telephon in Schall umgewandelt werden" (ibid.). There is the human mind, implementing a communicative intention into vocal articulation, which is transduced into a signal apt for the storage channel, and reverse: Shannon's diagram of communication *engineering*, with different degrees of "humanness" (nothing human inbetween, in the essential *medium* event of sending/storing and receiving/remembering).

The communicative relation between Krapp as present actor on stage to his magnetophonic voice is telephonic indeed; almost in parallel to Beckett's

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[11] Becker 1998: 162

[12] See Murray / Bohlmann (eds.), tape issue, Twentieth Century Music xxx

[13] V. Poulsen, Das Telegraphon, in: Annalen dre Physik, Bd. 308, Heft 12 (1900), 754-760 (755)

writing, a film version of Cocteau's play *La voix humaine*; put both human and telephone on stage.[14]

The wire recorder keeps a material (reverse) identity with telephony by wire; the very same wire serves as channel of transmission and as medium for suspended signal storage channel, while with Pfleumer's "singing paper", the magnetic tape roll rather induces the scissor practice of cut-ups (known from film editing).

Finally, with Digital Audio Tape (DAT), the tape becomes a hybrid: both analogue (spooling continuously) and digital (time-discrete signal recording, sample-based), thus resisting facile binaries and linking to other forms of data processing beyond audio for human senses, such as the Datasette for the Commodore 64 computer.[15]

What has changed from analog to digital media theatre, magnetic tape "loops" are replaced by algorithmic coding of the "if / then" loop. Instead of linear "rewind" / "fast forward" which depends on the materiality of the spool (Krapp's repeated "Spoool", making him articulate the actual *message* of the medium magnetophone) there are non-linear addresses (comparable to the rupture that happened between classic celluloid film editing and "cutting" on AVID).

In an operative sense, drama is machine related, in a performative sense it is body related. Both ratios converge in a definition of Media Theatre which not only extends but transcends human performance with its spatial and temporal constrains to non-human tempor(e)alities - as has already been expressed in Hugo Münsterberg, *The Photoplay*, 1916, as medium-specificity of cinematography against traditional theatre.

Beckett's logocenstrism? The missing machine noise

In true media theatre, it matters indeed whether materiality (noise) of magnetic tape can be heard as its medium message, apart from the anthropocentric focus of attention to the theatrical voice.

In Annie Dorsen's play xxx, instead of tape loops from analog voice recording, the speech unfolds in discrete Markov chains. Max Bense has already experimented with such techno-mathematical machine articulation in his radio play *Der Monolog der Terry Jo*. In Beckett's radio play *Embers* (1959), the noise of breaking waves at the sea shore figures metonymically for language itself.[16] In contemporary experiments with stochastic analysis in cybernetic linguistics, this metaphor became "literally litteral". Bense's *Monolog der Terry Jo* is based on a sea shore event again: a girl, surviving from anaufragy, is found without consciousness on the beach; in hospital, she starts to articulate a first

[14] See Rüdiger Campe, "Pronto!", in: Diskursanalysen 1: Medien, Opladen 198x

[15] See Bohlmann / McMurray 2017: 20, referring to John R. Watkinson, 'The History of Digital Audio', in Magnetic Recording, ed. Daniel, Mee, and Clark

[16] See Joachim Becker, Nicht-Ich-Identität. Ästhetische Subjektivität in Samuel Becketts Arbeiten für Theater, Radio, Film und Fernsehen, Tübingen (Niemeyer) 1998, 124-127

senseless, then increasingly meaningful monologue re-telling the trauma. In the sense of informational aesthetics Bense's radio play makes a non-human, bodiless voice speak: A vocoder sonified a computer-generated text consisting of letters with random distribution which increasingly become structered by ordering in Markov chains, to almost semantic patterns.[17]

[Wolf Kittler, Digitale und analoge Speicher. Zum Begriff der Memoria in der Literatur des 20. Jahrhunderts, in: Anselm Haverkamp / Renate Lachmann (Hg.), Gedächtniskunst: Raum - Bild - Schrift, Frankfurt/M. (Suhrkamp) 1991, 387-408, with a focus on J. L. Borges' essay *Die analytische Sprache John Wilkins* and Beckett's drama KLT]

Repetition and *différance*

Classical drama's metaphysics of presence rests upon two logocentric claims: that is represents human beings with the actual bodies of other human beings, and that it represents spoken words whith words spoken by those actual human beings"[18], while its "reliance on speech rather than on 'dead' writing gives it an immediacy which the novel [...] can never match" (op. cit. 126). In KLT, the very iterative possibilities brought about by the tape recorder undermines the phonocentric claim. Different from symbolically coded notation, magnetic recording operates on the signal event level which is always a time-signal, thereby "temporal object" in Husserl's sense), in fact "the acoustic materiality of the words themselves" (op. cit. 127) - just, not as "words", but as sound, which can rather be spetrographically captured in its elementary frequency components, that by abstract alphabetic letters. There is no fusion of the written and the spoken, but rather an active media-archaeological revealing of the unbridgable gap between symbol and signal. The ledger that Krapp consults in order to get a symbolic order into the continuous loops of the spools "forms an interesting counterpoint to the spoken voice that he hears on tape" (op. cit. 130).

Resulting in what Murray Schaeffer once termed "schizophonia", the tape-recorded voice, in replay, dissociates Krapp from himself, resulting in the tempoReal abyss which opens in the differential iteration. Still, the mechanism of the magnetophone induces Krapp to recover his past by temporal shifts and allows, by its button-based forward and backward options, typewriter-like operations. Both movements fuse in the turingmachine. The "endless" tape loop designed by Poulsen 1900 for his Telegraphon which is written and read by "Schreib-" resp. "Lesemagnete" (758, Fig. 5) actually prefigures the turingmachine indeed.

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[17] See Hans-Christian von Herrmann, Schreibmaschinenströme. Max Benses Informationsästhetik, in: Wladimir Velminski (ed.), xxx, 2009, 52-61 (59 f.), on Max Bense (with Ludwig Harig), Der Monolog der Terry Jo, in: Klaus Schöning (ed.), Neues Hörspiel. Texte / Partituren, Frankfurt/M. 1969, 57-91

[18] Steven Connor, Samuel Beckett. Repetition, Theory and Text, Oxford / New York (Basil Blackwell) 1988, chap. 6 "Presence and Repetition in Beckett's Theatre", subchapter "Voice and Mechanical Reproduction", 126-139 (126)

Lessness

Media archaeology is not just nostalgia for "dead media" electronic hardware like obsolecent magnetophone recording. It has a mathematical cutting edge as well. After Beckett, in his one-act piece *Krapp´s last tape*, had dramatized the recursivity of language related to magnetic tape memory, his echo to Max Bense's radio play *Der Monolog der Terry Jo* has been his short (non-)story *Lessness* from 1970 which can be deciphered (rather than hermeneutically "understood"), read and decoded computer-philologically with mathematic methods. Its description itself assumes mathematic form. "*Lessness* calls on 166 lexical items in its first half and not a single new one in its second half; furthermore, it displays <...> a compositional procedure which would allow it to extend its length almost inifitely without drawing on new items. Words 770-1,538 of the text turn out to be nothing but words 1-769 in a new order. It is this fact which suggests a mathematical approach to the text, an approach not only via the mathematics of indeterminacy, namely probability theory [...]. Is there a rule behind this re-ordering or is it random?" In the best sense of cybernetical aesthetics Coetzee in 1973 applied an algorithm adapted from constitutent analysis to segment the text and isolate the phrases, with the result "that there is no statistical reason for rejecting the hypothesis that phrases are distributed randomly over paragraphs". The new kind of dramatic time has been the runtime of the FORTRAN program: Total running time on a Univac 1106 is about 30 minutes."[19]

Irruption of media-traumatic "real" into the symbolical time-order of drama

With his steam-driven acoustic synthesizer mechanism, research artist Morten Riis at a former Transmediale festival in Berlin, and a subsequent demonstration in the) Media Theatre of Media Studies at Humboldt University) staged and revealed a dissonance between perception and cognition, since at unpredictable moments the mechanism collapsed and needed rebooting. Is this kind of media theatre planned accident or true malfunction? Can the real be given its place within the symbolic order, or does it rather occur in the a-dramatic field exclusively?

- "Hörspiel" as an art form in German, the radio play, in the anglophone world is often called "radio drama"[20]. This expression is still oriented at the definition of drama as literary script and in a way logocentristic (orientated at literature), as opposed to a radical medium-centristic (radio-phonic) approach: instead of the word-based radio play the acoustic-based "Schallspiel" which dramatizes the materiality of radio transmission itself - a genuinely media-dramatic approach.[21] But even here the apparent noise is still a controlled one.

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[19] J. M. Coetzee, Samuel Beckett´s *Lessness*: An Exercise in Decomposition, in: Computers and the Humanities vol. 7, no. 4 (March 1973), 195-198

[20] See Tim Crook, Radio Drama. Theory and Practice, London / New York 1999

[21] See Rudolf Arnheim, Rundfunk als xxx Klaus Schöning, Zur Archäologie der Akustischen Kunst im Radio, in: Westdeutscher Rundfunk (ed.), Klangreise. Studio Akustische Kunst: 155 Werke 1968-1997, Cologne 1997, 1-11; furthermore: Richard Kolb, Das Horoskop des Hörspiels, Berlin (Max Hesse)

["Realisation" has been the technical term for signal (esp. time axis) manipulation in early elelctronic music production - different from the symbolic order of the written score.]

Both tape noise and vocal asemantics is rather missing in Beckett's KLT. In Lacan's analysis the trauma frequently takes place in close contact (if not directly) with sonic media: be it the (still inarticulated) voice, the actual noise, the cry.[22] The acoustic dimension of violence has hitherto escaped historiography: the shapeless "real" of battlefield noise which conquered the soldiers' ears without being expressable symbolically by language or writing. Therefore the acoustic event remained, in its extreme forms, a traumatic ongoing presence, an unarchivable memory. In Arnolt Bronnen's theatre play from 1924 about World War I experience, *Katalaunische Schlacht* a gramophone becomes the protagonist itself which haunts the human actors by a spectral (in all senses) repeatable voice - literally nachträglich (in Freud's psychoanalytic sense).[23]

Very close to Sigmund Freud's comparision of the human mememory mechanism to the magic writing pad (*Wunderblock*) and its subsequent psycho-analysis, it requires a new kind of philological source critique (media "forensics" in terms of Matthew Kirschenbaum[24]) indeed to identify the machine as co-author of the media-theatrical drama. The so-called Magnetic-tape-viewer allows for techno-monumental philology (Eduard Gerhard) by making the identification of manipulations on tape such as re-recording, overwriting, erasure, cutting impulses and splicing, even the original recording machine, possible.[25]

Depending on the technical configuration, the wire recorder (Poulsen's *Telegraphon*) or the magnetophone (with its French term *écriture magnetique*) either erases the previous voice recording by new inscription; with neutral magnet erasure, a palimpsestuous, co-present interference still shines through.

In 1954 it has been revealed that, in the course of a 1952 recording of Wagner's Tristan und Isolde, featuring Kirsten Flagstad and the Philharmonia Orchestra conducted by Wilhelm Furtwängler (HMV ALP 1030–35), two top Cs were sung for the then elderly Flagstad by the then young Elisabeth Schwarzkopf and edited into the master tape.[26] The recorded, indexical real that listeners (apparently) expected has been violated by tape-based

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1932, and Friedrich Knilli, Das Hörspiel. Mittel und Möglichkeiten eines totalen Schallspiels, Stuttgart (Kohlhammer) 1961

[22] An argument by Annette Bitsch, Berlin

[23] See Helmut Lethen, "Der Knall an sich": Das Ohr als Einbruchstelle des Traumas, in: xxx

[24] Mechanism. xxx and the forensic imagination, xxx

[25] On such literally forensic applications, see Christian Koristka, Magnettonaufzeichnungen und kriminalistische Praxis, Berlin (Ost) (Ministerium des Innern, Publikationabteilung) 1968, 9-28 (146 f.)

[26] Martland, Peter. Since Records Began: EMI – The First 100 Years. London: Batsford, 1997, 198, as quoted in Twentieth-Century Music 14/1 (2017), 37

processes. A traumatic irritation of human sense of time and cultural memory results from the radically ahuman processuality of technical recording.

Any approach that ties audibility to human performative practice only and not to operative technological media as such is restricting the event to cultural history which tends to privilege evolutionary continuities and soft transformations rather than address the hard discontinuities introduced with the arrival of new media.[27]

Most of the prominent interpretations of media-enhanced dramas like Beckett's KLT hold views about the inseparability of cultural practices and new media[28], the arrival of new media can not be reduced to discursive effects but actually induces cultural choques. Culturally formated ears, "wrapped up in the Symbolic and Imaginary registers, can not hear how audio technologies expose the Real"[29]. It requires the *media*-archaeological ear such as spectrography to reveal such essentials.

[In their different technological essence, such recordings induce a different kind of scientic analysis which is not limited to philology or musicology any more but researches the sub-semantic poetic articulation on the media-archaological level (spectral analysis with electronic measuring media), thus revealing evidence of a different (sub-poetic) kind.]

Tape age(s): Time, temperature, entropy

KLT is a drama about ageing. But as with the human actor *versus* technological agency constellation on stage, the ageing as drama here is incorporated in "two bodies" (Kantorowicz) as well.

[There is a growing asymmetrie between media time (the tapes which re-play Krapp's voice invariant to temporal progression, whenever it is subjected to the magnetic recorder), and Krapp's biological existence which is subject to aging (that is: entropy).]

[The electronic tube, especially the triode, once liberated electro-magnetic media from mechanical constrains, thus from erasure over time; still they are subject to decay over time themselves. "Digital" persistance against entropic time (binary "information") ows its ahistoricity rather to its different form of processing: still signals (recording the physically real acoustic event), but symbolically decoded as information in the mathematical and logical binary sense.]

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[27] See Brian Kane, Relays: Audiotape, Material Affordances, and Cultural Practice, in: Twentieth-Century Music 14/1 (2017), 65–75 (72), referring to W. E., Digital Memory and the Archive (Minneapolis: University of Minnesota Press, 2013), 38

[28] See Brian Kane, Relays: Audiotape, Material Affordances, and Cultural Practice, in: Twentieth-Century Music 14/1 (2017), 65–75 (73, note 24)

[29] As paraphrased by Kane 2017: 73, referring to Friedrich A. Kittler, Gramophone, Film, Typewriter (Stanford, CA: Stanford University Press, 1999

The magnetic tape is both subject and object of time-shifting. On the one hand, a voice recorded on tape does not age.[30] - a kind of temporal "ekstasis"[31], subverting the accidental phonocentristic tradition. On the other hand, the tape itself is subject to ageing.

In Beckett's drama *Krapp's Last Tape*, the tape serves as material metaphor for a different media-induced temporality. "Metaphor" is not meant metaphorical here in the rhetorical sense but very literally "signal transfer". The phonographic signal is in principle (*en arché*) invariant towards historical, circumstantial change. Once recorded on a material storage medium, sound is trusted to a technical apparatus to be come into acoustic existence again, which is either electro-mechanic or electronic signal transduction, or signal processing from within digital media.

While Samuel Beckett in his corporeal uniqueness has entropically dissolved (like the successive actors performing Krapp) and survives rather as a set of alphabetifcally coded texts (his oeuvre), a magnetophone surviving from the original stage event (1958) can actually be re-enacted. Recorded as signals on tape, a "bodiless" voice (even Beckett's) transcends textual historicity.
"Da die Tonbandstimmen nicht altern, stehen sie monolithisch außerhalb des organischen und biographischen Zusammenhangs."[32] But what if the magnetic spool itself ages? Tape ageing expresses itself physically: "restoring tape recordings; binder hydrolysis or 'sticky-shed syndrome' one of most troubling playback problems associated with certain tape brands"[33], contrary to the claim expressed, e. g., in the trademark of the "Permaton" spool. "[...] A temporary remedy for the problem is to bake the affected tape in a scientific oven at a low temperature for a few hours. Once the tape has cooled for twenty-four hours following the baking process, the tape is able to be played without shedding for about a week before it reverts back to its sticky shed condition. The treatment provides a small window of time for the tape to be safely played for digitization" (ibid.).

Delayed phonocentrism

Different from the philological, rather phenomenological description of the voice from tape in its effects on (and media-induced irritations) of human "inner time consciousness"[34], media archaeology approaches the event from within the technical media drama itself. Elvis Presley's "slapback" voice, resulting from the usage of two Ampex tape recorders in the Sam Philips' Sun Record studios, is a condensed version of Krapp's voice recording in KLT, a

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[30] Becker 1998: 171
[31] See Günther Stern's habilitation thesis from 1930/31, *Die musikalische Situation*, edited by Ellensohn, xxx
[32] Becker 1998: 171
[33] Steven Weiss, "Tapes on Open Reels: Tia Blake at the Southern Folklife Collection", in: Twentieth-Century Music 14/1 (2017), special issue "Tape" (eds. Andrea F. Bohlman / Peter McMurray), 149–151 (150)
[34] See Edmund Husserl, On the phenomenology of the conciousness of internal time (1893-1917), transl. John Barnett Brough, xxx

micro-"remembering" resulting from tape delay echo within the 100 millisecond interval.[35]

Presley as well as his gitarist Moore and bassist Black "*first* found their voice in the Sun Studio"[36]. Alvin Lucier's tape-based media installation *I'm sitting in a room* (19xx) which consistes of echo-delayed re-recording of a sentence has been a seminal moment in site-specific and time-based media art. In popular music, Elvis Presley's pop-musical voice actually "did not exist until it was recorded. Dealing with the echo, Presley developed a vocal style which had the function of exposing the echo."[37] And "it is *in* the voice. As a consequence a dualism of an intrinsic sound and an extrinsic effect is undermined here"[38] - "a special organization of time" from within the magnetophone.[39] Techno-chronopoetically, "the reproduced and delayed signal can be directed via the mixer to the other tape recorder [...], where only the recording head is activated. At the mixer, the slightly delayed signal is mixed with the other signal of the other microphone. This means nothing else than that the band is recorded not only once but twice by the second tape recorder [...]. [...] Sonically this time lag becomes perceivable as a kind of echo on the voice" = Papenburg op. cit.

The audio-visual difference

In Beckett's drama the magnetic tape reels still keep an indexical, analog relation to the biophonically recorded voices of the protagonist who rewinds them on occasion of every successive birthday.

In Samuel Beckett's play *Krapp's Last Tape* (1958) the main (human) actor gets lost in the actual loops of his audio-taped autobiographical memories. Beckett's one act drama only works on audio magnetophone for his diary-like voice recording, not - as experimented in a recent performance - with his video image recording.

How would Beckett's drama (not simply be *re-enacted* but) be *re-written* today: not replacing audio by video (a production of the Schloss Neuhardenberg Foundation, *première* 1st June, 2007, with Josef Bierbichler, under direction of B. K. Tragelehn, Schaubühne); analog video = technical extension of magnetic

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[35] See Tilman Baumgärtel, Schleifen. Geschichte und Ästhetik des Loops, Berlin (Kulturverlag Kadmos) 2015, 122

[36] Peter Doyle, Echo & Reverb. Fabricating Space in Popular Music Recording 1900-1960, Middletown 2005, 183

[37] Jens Gerrit Papenburg, Transatlantic Echoes. Elvis Presley's Voice as a Product of German Magnetic Tape Machines and its Function in Americanisation of Postwar Germany. Skript version of a lecture at conference *Cultures of Recording*, April 10, 2008, Centre for the History and Analysis of Recorded Music, Royal Holloway, University of London, Egham, referrring to: `Peter Doyle 2005: 184`

[38] Papenburg op. cit., referring to `Théberge 1997: 210`

[39] Papenburg, op. cit., referring to Manuel DeLanda's description of such temporal effects and affects. See DeLanda, *Intensive Science and Virtual Philosophy* London & New York (Continuum) 2002, 72 f. and 111 f.

sound recording (Bill Viola, The Sound of One-Line Scanning, in: xxx); in 1958 (KLT), the US Ampex company had just begun to produce an apparatus for television image recording

A television adaption of KLT has employed a flash-back technique for the scene with the girl in the punt, and in a London production "video-tape was substituted for sound-tape and multiple television screens for the single tape-recorder."[40] From a media-archaeological point of view (which is internal medium ontology), though, what appears discontinuous for human audio-visual sensing, it simply two emanations of one technology. Video image recording has beein directly derived from the acoustic tape recorder; video artist Bill Viola actually defined the electronic (video / TV) image as an iconic escalation of sonic one-line scanning.[41]

This can be demonstrated by the failure of the videophone (e. g. thew Picturephone developed by the Bell Laboratories after Second World War), vocal immediacy over distance - which can be applied to temporal distance as well. In bridging the gap between the present and the past, vocal immediacy differs from the visual one. "Rather than 'vocal immediacy across distances', telephony should perhaps be defined more broadly, as *communicative immediacy at a distance*".[42] The presence affect is different here and can by no means be subsumed under the umbrella term "audiovisual media".

How to re-enact KLT today

As a very literal media-archaeological challenge, there "remains" the challenge in preserving original reel-to-reel tape machine from previous dramas and analog media art for contemporary enactment. In Simon Emmerson's muscial piece *Spirit of '76* (1976), a reel tape machine has been applied to create an accelerating tape delay; the effect is achieved by letting one of the two reel tape machines drag an empty tape spool around the performance floor. "Although the sonic effect of the delay can easily be reproduced with digital means, such as a Max/MSP patch, the theatrical effect or the sliding spool gets lost."[43]

What really happens inbetween the human voice and magnetophonic recording: "carpentry" as media-theatrical research

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[40] James Knowlson, *Krapp's last tape*: the evolution of a play, 1958-75; *online* http://www.english.fsu.edu/jobs/num01/Num1Knowlson2.htm. See same author (ed.), Samuel Beckett, Krapp's Last Tape. A Theater Notebook, London (Brutus Books) 1980

[41] "The Sound of One-Line Scanning", in: xxx

[42] Mara Mills, The Audiovisual Telephone. A Brief History, in: Henry Keazor / Hans W. Giessen / Thorsten Wübbena (eds.), Handheld? Music Video Aesthetics for Portable Devices, Heidelberg (ART-Dok) 2012, 34-47 (43)

[43] Composer Sebastian Berweck in his dissertation: It worked yesterday. On (re-)performing electroacoustic music, submitted to the University of Huddersfield for the degree of Doctor of Philosophy, August 2012

Did Beckett care about the technical details, or rather limit his poetic imagination to the resulting phenomena? Neglecting the function of Krapp's bananas in KLT, media archaeology focuses rather on the microphone and the scene of the voice-tape-coupling. The human voice creates vibrant pressure on the microphone membrane which converts the acoustic wave into an electric signal by varying the magnetic field of an iron core wrapped around by a wire coil. In the magnetophone, the electromagnet receiving this fluctuating voltage magnetizes the metal oxide particles glued to a celluloid band of tape. From that moment, the metal particles in their polarisation keep the alternating voltages of the sound signal and can be converted back (after electronic amplification) into acoustic waves emenating from the loudspeaker without being erased themselves (like the ephemeral nature of spoken language). In sharp contrast to the invasive phonographic recording, this does not making an imprint on a material[44]; in addition, the magnetic tape is "biased" with a high-frequency signal immediately before the actual low-frequency voice recording in order to improve the signal-to-noise ratio (dynamics) - which means that there is (implicit) "radio" in magnetophonic audio recording.

Once coupled to such a signal recording and reproducing machine, a human becomes subject to inhuman media time. "A machine" (like the magnetophone) "with superior techincality is […] an open machine that also assumes humans as interpreters and organizers - this is what is called a 'technical ensemble'. Humans may […] be mediators in a machine's effort to connect and in that sense become part of the machine's operations"[45], Ina Blom paraphrases philosopher of technique Gilbert Simondon, whose *Du mode d'existence des objets techniques* has been published in Paris (Aubier) in 1958[46] - the very year of KLT's première.

When Krapp is handling the apparatus, it is its very resistance which reveals its technicity in the sense of Martin Heidegger's "hammer" argument in *Being and Time* (1927). In moments of failure, the medium changes from its "ready-to-hand" status into the "present-at-hand" mode - which is called "carpentry" in Ian Bogost's object-oriented *Alien Phenomenology*.

Therefore my preparation for this talk could not be textual Beckett studies only; I rather dived into the Media Archaeological Fundus to re-experience the technological resistance as *Zeug* (Heidegger's "Aufsässigkeit") with a GDR Smaragd magnetophone which has been contemporary to Beckett's play in 1958. Media-archaeological research, different from historical studies in the record archives, needs to know 2hich has been the apparatus Beckett actually had in mind and applied in the world première of KLT in 1958.

Listening to the magnetophone with media-archaeological ears

Micro-temporal media archaeology with its non-human conceptualizations of sounding media, memory, time and sound objects can be paired with object

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[44] Blom 2016: 160

[45] Ina Blom, The Autobiography of Video. The Life and Times of a Memory Technology, Berlin (Sternberg Press) 2016, 26

[46] 2nd ed. Paris 1989, 12 f.

oriented ontology and speculative realism indeed, both experiencing and exerimenting with the various temporal processes unfolding within technology, letting media themselves become active archaeologists of insight and knowledge.

What do human ears hear when they listen to a recording of your voice on tape - the voice or the magnetized particles of the tape and the impact on the sound by the channel of storage or transmission which alters the signal in nonlinear ways? The development of recording and reproduction technologies has always been media-phenomenally oriented at the human ear as destiantion; in terms of Shannon's communication diagram, though, the technical communication between sender (transducer or encoder) and receiver (demodulator / decoder) is an internal technical coupling *inbeween*, in the *eigenwelt* cut off from human or natural environment. Different from the human ear which only reacts to acoustics, the electronic apparatus has a sense for implicit sonicity (like in Walter Benjamin's world the camera eye has access to kind of an "optical unconscious"[47], just like Dziga Vertov's concept of the *kinoki*).

The tape machine itself does not care about acoustics, it is not interested in the coupling of electrical signals to vibrating sound waves in air. It cares about what magnetic coating the polyester tape consists of, the speed of capstan drive, Dolby and DBX filter curves, and Resistor-Capacitor time-constants. A line of thinking that subscribes to the latest developments within the object oriented philosophy.[48]

Therefore media archaeology investigates the notion of memory and time from the point of view of the tape recorder, in an attempt to locate the "ears of the machine", which opens the possibility to get closer to the actual physical operational technology itself.

The tape is covered with domains of randomly oriented magnetic fields, but when the material gets magnetized by alternating current the domains are swung from their random distributed positions into analogous wave forms. While KLT focuses attention on the human idiosyncacies and failures of memory and recall, since the presence of a human actor on stage attracts the phenomenal attention from the "audience", the real techno-drama of forgetting is within the magnetophone itself where effacing magnetic memory is the basis of the tape recording itself. The first agency which the revolving tape meets is the erasure head with its function to eliminate all previous intended or accidental previous recordings - unless this is intentionally preserved, in a different circuitry, for palimpsestuous dubbing. Its capacity to manipulate auditory content electronically centers around its three tape heads - erase, record and playback - each containing an electromagnet having the ability to convert an electrical signal into a magnetic force that can be stored on the passing magnetic tape, and conversely convert the magnetic content of the

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[47] See Walter Benjamin , A Short History of Photography, in: Screen no. 13 (1) / 1972, 5-26

[48] As expressed in Morten Riis, Where are the Ears of the Machine? Towards a sounding micro-temporal object-oriented ontology, in: Journal of Sonic Studies, https://www.researchcatalogue.net/view/219290/219291

tape into electrical current. In most devices the record and playback heads are combined into one, allowing for immediate auditory monitoring.

While Beckett stages the drama of remembrance, forgetting and repetition in KLT as a symbolic mechanism, actual forgetting and recording takes place within the magnetophone itself, in its magnetization and erasure operations.

Only such "tight coupling" (Fritz Heider 1926) between a human voice and a sonic technology constitutes real "media theatre"; the micro-dramaturgies are governed by techno-logics itself, be it analog electronics or digital algorithms.

The media-archaeologic momentum is the transsubstantiation of the voice in its becoming signals on magnetic tape. The media-epistemic "event" is the momentum of transduction (German *Kontaktstellen*) where the pick-up inductively follows the phonographic groove; the focus of media-archaeological investigation is the tempor(e)ality of *operative* media. No simple translation takes place here (like in "language"), rather a transsubstiation from mechanical movement of the record player (direct impression of sound waves) into electro-magnetic signal latency; immediate (sensual) *Schall* thereby becomes simply a function of a manifold oscillating regime (even in the optical Laserdisc "reading"). Technical *transduction* converting acoustic waves into electric voltage and its magnetic storage still preserves a transitive relation, while digital sampling and quantizing radically disrupts the physical signal into informational *bits* which are rather decoded: "reading" again.

[One passage in Beckett KLT remembers: "We lay there without moving. But under us all moved, and moved us, gently, up and down, and from side to side." This poetic memory of Krapp on a boat with his women, spoken and re-played as an auditory diary entry on magnetic tape, actually reflects the movement of the tape on spool itself - the way signal recording media challenge human perception of movement and stillness, turning it upside down, transforming continuous movement into quantifiable frequencies (since chronophotography).]

Case Kurenniemi

A media-specific kind of memory emerges when an individual becomes signal storage in electro-acoustic devices.

From 1972 to 1974 Finnish artist-engineer Erkki Kurenniemi recorded private everyday entries on cassette tapes, just like in Beckett's one act drama the protagonist keeps a phonetic diary on magnetophone.

[From the early 1980s onwards Kurenniemi also kept a video and photograph log of his surroundings and personal events, "with the aim of producing material for a digital sampling of his life which, some time after his death, would algorithmically be revived.]

Different from Goethe or Krapp's ledger (registry), Kurenniemi did not yet pre-structure it as an archive to "govern" his future memory in anticipatory ways as archival future-in-the-past. How to cope with such an abundant mass of audio-

visual and textual data in terms of an "open" archive, that is: multi-variant access, multiple interfaces, no filtering meta-data, no unifying index, not reducing the raw data to taxonomy, not just tags for grouping and retrieval? The answer is in the software tools of the ActiceArchive project (Constant, Bruxelles).[49]

The Ticket that Exploded

For William Burrough, human memory itself functions like a tape recording machine: "remember that your memory bank contains tapes that you have ever heard ... press a button, and a news broadcast you heard 10 years ago plays back"[50] like an Mellotron sound sampler. Once this analogy is admitted, it extends to electronic time-stretching as well.

One chapter in Steven Connor's work on *Beckett, Modernism and the Material Imagination* is called "Looping the Loop: Tape-Time in Burroughs and Beckett". For Henri Bergson, time unfolds like a "tape running between two spools", as expressed by Timothy Scott Barker.[51]

Paul Bowles' 1966 novel *Up above the World* is about magnetic tape experiments. William Burroughs and Brian Gysin experimented with paper cuttings for poetry composition, and consequently with magnetophone tape "cut-ups", resulting, among others, in Burrough's phonographic record (of magnetophone) album *Nothing Here Now but the Recordings*.

[Burroughs, in his piece *The Ticket that Exploded*, considers language as a "virus". The philological risk is that Burroughs scholarship reduces such arguments to the idiosyncrativ mind of the author. Such visions are rather a symptom (articulation) of an epistemological hypothesis which is cybernetics: be it machines or animals, once coded (be it the human acquisition of language, or source codes implemented as software in computers), both are subject to the symbolic order and become compatible as systems.]

In the "writing machine" section of *The Ticket That Exploded*, Burroughs locates the writing scene itself within the technological artefact: inner media theatre, "a room with metal walls magnetic mobiles under flickering blue light and smell of ozone"[52], which obvisouly is the inside of a magnetophone based on thermionic tubes.

In Burrough's experiments with time-axis-manipulated voice recordings, the temporal event is fragmentized: magnetophonic cut-ups of human language, as described in his manifesto *The Electronic Revolution* (1970). Nothing here but

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[49] See Cox / Murtaugh / Mallevé, xxx, in: Ina Blom / Eivind Rossaak (eds.), Memory in Motion, xxx

[50] As quoted in Joe Banks, Rorschach Audio. Art & Illusion for Sound, London (Strange Attractor Press) 2012, xxx

[51] Time and the Digital. Connecting Technology, Aesthetics, and a process Philosophy of Time, Hannover, New Hampshire (Darmouth College Press) 2012, 59 f., referring to: Henri Bergson, The Creative Mind, N. Y. 1934/1992, 164

[52] TTE: 62, quoted here after Hayles 1999: 216

the recording? In *The Ticket that Exploded*, Burroughs "[...] took seriously the possibilities for the metonymic equation between tape-recorder and body. He reasoned that if the body can become a tape-recorder, the voice can be understood not as a naturalized union of voice and presence but as a mechanical production with the frightening ability to appropriate the body's vocal apparatus and use it for ends alien to the self."[53]

Already in Platon's primordial media critique *Phaidros*, the real "dialogue" is not between philosopher Socrates (which is rather an invention by Platon himself) and his pupils (the deceptional "content"), but between reader and writing. This corresponds with KLP where the script notes asymmetric dialogue partners: "KRAPP" and "TAPE". By externalizing the "inner monologue" of human consciousness by mechanical manipulation of tape recordings, Burroughs joins the Turing / Lacan hypothesis that in the moment a human is algorithmically processing sequences of symbols (bei it numbers in mathematics, be it letters in writing / reading), he / she is in an operative (rather theater-performative) mode and becomes machine itself. It is not by coincidence that Alan Turing (1936) models his algorithmic machine according to the newest electronic medium of his days: the magnetophone, with the "write / read head" moving across an (ideally) endless tape.

Techno-traumatic silence

The last remark in Beckett's script declares: "KRAPP motionless staring before him. The tape runs on in silence"[54] - which is Bergsonean *durée* in its purest form, against which engineers developed the auto-stop.

This coincides with a techno-dramatic silence induced by the final remark ("End of recording") in the protocols of cockpit conversations preserved on magnetic recording from the "Blackbox" in airplane desasters, where one of the two components (next to the Flight Data Recorder FDR which registers the machinic "communication") is the Cockpit Voice Recorder CVR for all kind of semantic and non-semantic speech and noise in the cabin. The doubly protected CVR -Blackbox contains, in the USA since 1966, a 30 minute magnetic tape loop which erases itself after each turn. Both FDR and CVR are additionally provided with a submarine ultra-sonic sender which emits signals after a possible crash for 60 days for location.[55]

It has been Becket himself who introduced a dramatic change into his media scenario. At the very end of the 1969 Berlin Schiller Werkstatt production of KLT (and subsequent productions in Paris and Royal Court Theatre in 1973): "Instead of the curtian closing on a motionless Krapp, staring in front of him with the tape running on in silence, Becket had both the stage and the cubby-

[53] Katherine Hayles, How We Became Posthuman. Virtual Bodies in Cybernetics, Literature, and Informatics, Chicago: University of Chicago Press, 1999, 211, referring to William S. Burroughs, The Ticket That Exploded, New York (Grove Press) 1967, 49
[54] KLT 1958 / 1965: 20
[55] See Malcolm MacPherson (ed.), The Black Box, New York (Quill / William Morrow) 1998

hole lights fade [...], leaving only the 'eye' of the tape-recorder illuminated. This change, 'originally an accident - heaven sent' Becket wrote, accentuates a theme and contributes to an effect that is fundamental to this play [...]".[56] While the literary scholar does not further take care ot the technical details, media archaeological analysis pays full attention to it. The "eye" is apparently the "magic eye", the oscilloscope-like indicator of the signal dynamics, a vacuum tube which is the only point where the inner electronics of the machine (apart from the mechanic input / output and spool-winding knobs) pierces through, interfacing the outer and the inner world of media theatre, a metonymy of the theatre curtain itself opening and closing.

Loops, analog and / or digital: *Krapp's Last Tape* and the *Halteproblem*

Paradoxically, the magnetic tape which is meant for memory recording, by its very spool time-figure has an inherent "sense of ending". Turing's algorithmic finite automaton is based on the (purely theoretical) assumption of an infinitive, endless, never-ending storage *tape* for intermediary notation.

Its loop structure is characteristic of the classic magnetic tape (reel-to-reel); "loop forever" reminds of Samuel Beckett's play *Krapp's Last Tape* (first performed in London 1958) which ends with director's note "tape runs on in silence" - an endlessness which has been answered by technology by introducing the auto-stop mechanism at the end of a tape on spool.

In parallel (and contrasting) to KLT, in digital computing a different *Halteproblem* emerged, as the nondiscurive challenge to Beckett's drama. In fact, loops, as iterative procedures (recursions), are the predominant *chrono-tropes* in computing time.

The following pseudocode illustrates a straightforward way to compute g:

```
"procedure compute_g(i):
    if f(i,i) == 0 then
        return 0
    else
        loop forever"
```

"Because g is partial computable, there must be a program that computes g by the assumption that the model is Turing-complete. This program is one of all the programs on which the halting function h is defined."[57]

The problem in the *Halteproblem* is "to determine, given a program and an input to the program, whether the program will eventually halt when run with that input. In this abstract framework, there are no resource limitations of memory or time on the program's execution; it can take arbitrarily long, and use arbitrarily much storage space, before halting. The question is simply whether the given program will ever halt on a particular input" (Wikipedia).

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[56] Knowlson, referring to Beckett's personal letter to J. Knowlson, 18 May 1972
[57] Wikipedia, entry "Pseudocode"