> [It was] a premonition also of an eternal separation! Many are the times, as I listened thus without seeing her who spoke to me from so far away, when it has seemed to me that the voice was crying to me from the depths out of which one does not rise again, and I have felt the anxiety that was one day to wring my heart when a voice would thus return (alone and attached no longer to a body which I was never to see again), to murmur in my ear words I longed to kiss and they issued from lips for ever turned to dust.[10]

It thus also anticipates imminent separation. Romantic literature (such as Chateaubriand's *Memoirs from Beyond the Tomb*) preferred to focus on the voice from the grave; in the twilight of the nineteenth century, this despotic signifier became technical.[11] The voice that has been puzzling the dog Nipper on the logo of the HMV ("His Master's Voice") record label since 1900 was analytically mastered by humans with the help of the sonagraph—a measuring medium that visualizes speech as a special case of frequency distribution *in time*.

In contrast to the voices emanating from the phonograph, the reception of classical radio voices has a direct indexical time reference to the acoustic event of sending in an electrophysical sense. "The basic characteristic of the relation between radio and time is the time-coincidence of the 'phenomenon' to which we are listening and the broadcast performances."[12] In calculating space, this precise time reference is cut. The temporal sense, which in human perception is connected with vocal articulation (fed back to the ear) and yields corresponding presence affects, is disrupted by the timeless space of computer voices, which remain invariant with respect to time due to the fact that discrete buffering is a necessary condition of their transmission.

Computer-synthesized speech is now able to produce presence (i.e., "live") affects that are in no way inferior to the living presence of natural speech. The Turing test could thus be time-critically modified to determine whether the received message comes from the present or the past.

(DE-)DISTANCIATION: THE APPEARANCE OF "LIVENESS" (RADIO AND TELEVISION)

Electronic telecommunication media initially constituted a memoryless technical enframing (*Gestell*); their analog temporal mode was defined by virtually instantaneous electromagnetic signal transmission. In order for them to operate, only electrical energy had to be stored, yet the dependence of electronic presence on stored electricity was not apparent until the moment when the power supply of telegraphs, telephones, and radios broke down. Every army signal corps and broadcasting organization thus has a reserve of "storage batteries" at its disposal "in order to maintain communication."[13]

The media for storing real physical events (photography, phonography, and cinematography) were joined in the twentieth century by the media of pure transmission, the most prominent of which was initially radio.

> It converts and transmits sounds, but it does not store them. Electromagnetic waves would be the memory, but they are . . . only relativistic effects of electrical energy. An important phenomenological feature corresponds to them—namely, radio is in a strictly formal sense always only now, this moment, unstorable, bound to the present moment of the radio event on a continuous time axis. That's why McLuhan says the medium is "hot."[14]

McLuhan's systematic distinction between "hot" and "cold" media can thus be extended to encompass the media-technical modes of creating presence and disrupting temporal perception—time-intensive and time-extensive. As Theodor W. Adorno wrote in a typescript from 1940 that not coincidentally bears the plain text title *Current of Music*, "The 'radio voice' creates a strong feeling of immediate presence. It may make the radio event appear even more present than the live event"[15]—a form of hyperpresence, in which the concept of radio transmission is ultimately transferred metonymically to the musical event itself. The temporal characteristics of electrotechnical "liveness" correspond to the perceptual impression of "real time." "This feeling of presence necessarily means a feeling of immediacy, too. There is no gap and no mediation between the time something is going on and the time at which you are listening to it."[16]

Adorno thus identifies the fundamental relationship between radio and time: "the time-coincidence of the 'phenomenon' to which we are listening and the broadcast performances."[17] At the limits of the light speed of electromagnetic transmission, *delta-t* tends toward zero: "This time difference is so infinitesimal that it may safely be overlooked."[18] The virtually real temporal indexicality[19] of so-called live broadcast media is the secret of their effectivity. "Radio always tends to make us forget that is gives us in other respects a mediated phenomenon."[20]

The time relation of telecommunications, which is denoted by the term "live," not only applies to sound transmission. In Albert Robida's futuristic novel *The Twentieth Century* (1883) telephony is joined by the option of transmitting images over distance. "The performance is truly witnessed with the eyes and ears. The illusion is complete, absolute!"[21]

With the development of magnetic videotape, electronic television—until then primarily a technology of direct transmission—entered the virtual world of time-shifted broadcasting ("deferred time").[22] This time delay had previously only been common in the domain of the symbolic order through archival latency (as the task of the archive is to preserve records for future

reference). From the beginning of radio drama, the key technoaesthetic features of radio—namely, the simultaneity of production, transmission, and reception—were threatened by recording media,[23] and this situation was once again repeated with the arrival of magnetic videotape, as television drama faced a similar threat.

From this time on, broadcasting occurred in a time horizon that encompassed storage and transmission. Audiences could now hear a radio broadcast whether actually "live" or a play from the archive. From a signal-technical perspective, both cases strictly involve a "live" event (regardless of content), yet digital coding adds the first element of ultra-short intermediate storage (which is audible as a time delay with respect to the same broadcast on analog radio). Radio is a constant mixture of "live" transmission and recording from the electronic sound archives; as transmission from magnetic tape, "live" and archive represent two extreme values of what is always already differentially entangled in the electromagnetism of the technical medium—in terms of media-archeological categories, they are thus equiprimordial. In between is the concept and practice of "live on tape"—a term used in television production to refer to the indistinguishability of recorded image signals and their "live" camera transmission. In the "live" broadcast, the sensation of simultaneity is not an illusion; rather, it is real in terms of transmission technology—apart from infinitesimally short *propagation delays* caused by the electronics. Prior to the development of photography and phonography, the perception of the present was always already categorically separated from the past, as it was not possible to record fleeting images and sounds, and the time index of the past was thus a function of its irretrievability at the signal level. This culturally self-evident concept of the past was disrupted by technical recording media. In 1941, Gerd Eckert wrote: "In radio broadcasting . . . the event speaks to us in its own unadulterated speech, even when it is prerecorded."[24] No individual "I" is speaking here, but rather the "it" of the apparatus. Radio broadcasting thus becomes a means of time management, and it creates the impression of real presence even when no body is actually present. The separation of voice and sound from the body through technical recording and transmission set new conditions for the Western temporal economy, as the time that had previously dominated cultural techniques became media-technically available.

Unlike the sheer physics of mechanical media, like gramophone and film, a theory of electronic storage media necessarily points to dilatory time. There exists here no abrupt separation between the past (recording) and the present (replay), but rather a transitive shift from the technical signal character of "live" transmission to the recorded signal, as the process is basically the same: electromagnetic induction, which is itself a model of a relatively entangled processuality of time and event. Media storage is thus less an archive of the transmission than a form of decelerated, temporally extended present.

When transmission is described as the linking of systems (which can thereby change their form), this interconnection can open up a temporal gap that varies in the moment of implementation from an *ideally* pulse-like zero time difference to emphatic dilation. The time delay is a horizon that potentially stretches from immediate to long term, while still retaining its transmission-symmetrical quality.

At the radio speaker or television screen, human perception was unable to determine whether a transmission involved spatial or temporal distance—in other words, whether the transmission was recorded on tape. Because the auditory and optical senses physiologically deem it present, a television broadcast must explicitly announce this at the symbolic level as meta-information: "This program was recorded." The time-shifted transmission of a recording involves both sublated and deferred time—*différance* as differential spatio-temporalization, to use the more precise terminology of differential calculus. Recorded and transmitted human articulations are not simply allegories of time or life, as in painting and sculpture,[25] but rather moments of lived time that are actually *sublated* in the electromagnetic field.

All that remains is to consider how time figures that continually appear as phenomena in the field of electrophysics influence the model of time through which they are cognitively understood. It actually already began with photography: while it initially stored moments that were quite prolonged, it suddenly shifted to moments that were infinitesimally short—depending on the shutter speed of the camera and the sensitivity of the chemical storage medium. The recording of a "live" radio broadcast *for the purpose of* its permanent retrievability is not the antithesis but rather another form of transmission; technical storage and transmission allow something to be *simultaneously* historical and actual. This relationship is also reflected in the sonic event itself.

> As Jean Paul and many others have said, sounds have no "present," no objective reality separate from or prior to their resonances . . . in (parts of) ears and bodies. The "present" in which their oscillations are presentlessly realized is their resonance or reverberation. As an object of acoustics (of countability and calculability), the reality of a sound is also a figure and thus subsequent to that which actually not *is* but rather ("eternally") *becomes*.[26]

It is therefore a presence that does not exist at a precise point in time, but rather only reveals itself in the extension of protention and retention. Sound, which is mathematically addressable through Fourier analysis (like any oscillation event), thus shares an essential characteristic with time itself in so far as it (following Aristotle) is conceived as a counting movement.

At the level of acoustics, an echo is an indicator of a time-critical transition from the present to the past. Compared with this, the transition in the

electromagnetic field is virtually instantaneous; however, an infinitesimal time delay also occurs here, which always already represents a differential between present and past. The echo is an acoustic phenomenon whose uncanniness lies in the fact that the sound in the present and the sound from the past blur together. In principle, all oscillatory processes create not only reverberations, and thus a transition from the present into the past, but also pulses; they cannot be reduced to two- or three-dimensions (in terms of the human ear or the sense of sight), but rather they always also extend into the temporal dimension. The human perception of reality physiologically encompasses each physical presence in space and time, but this immediate perception is not selectively oriented toward the present moment; rather, as Bergson emphasizes, it is also rapidly converted into memories and associations (which happens completely independently as dreams). Telegraphic image transmission already produced the sensation of "liveness," although at first it was unavoidably the function of a storage medium and was written on a storage medium (such as paper strips). Film was also able to affect perception in its immediate presentness, although it was dependent on celluloid. Television was the first medium able to broadcast "live" in a technical sense; this mode is linked to actual and perceived synchronicity, and it is thus radically temporalized. The localization of perception is sublated, but the temporalization remains authentic. Through the impression of synchronicity, "live" television was also able to create the impression of being-there (*Dabeisein*) across spatial distance—a creation of presence according to the power of electronic transmission media. But how real is "liveness"?

> One can no longer distinguish, visually or aurally, between that which is reproduced and its reproduction . . . not even discern *that* or *when* reproduction or repetition, in the manifest sense of recording or replaying, is taking place. We must be informed whether or not what we are seeing is "live". . . . We cannot distinguish through our senses alone between what we take to be simply "alive" and what as reproduction, separated from its origin, is structurally posthumous . . . what Derrida called the irreducible "iterability" of the mark.[27]

In principle, this extensive indistinguishability also applies to the letter (in mailboxes or archives)—that is, literal writing; at the moment of reading, letters are just as immediate to the sense of sight as electromagnetic waves are to the ear. In terms of frequencies, however, it is blatantly obvious that the worldliness of oscillations (the superimposition of waves to form sound or light) mediates itself—and, as a recording, this applies to the worldliness of the past or distance. With respect to information, the difference between remoteness as past and remoteness as distance is entropic: a transmission from the remote present has the potential for veto or intervention, such as

when the message follows a gunshot—which does not apply to messages archived on magnetic tape. The domain of the symbolic (writing, letters) was for the longest period of time not worldly, but this changed with the development of binary code, which—implemented in digital media—was not only able to control sounds but also synthetically generate them.[28]

MAGNETIC TAPE RECORDING: STORAGE OR PRESENCE

The same tape head that induces tonal alternating currents when in contact with the passing magnetic tape is also able to process signals that come directly from a transmission line, yet it is conversely in the same situation as a radio broadcast, as it makes no audible difference whether the sound signals are sent "live" or from tape. From the perspective of media archeology, the objective fact of the radio broadcast is in a technical sense constantly "live." The same technical differential results in the entanglement of the past (storage) and the present (broadcast). The sonic (techno-acoustic) event is invariant with respect to the time axis; it constantly yields the same phases, progressively deferred with progressing time, as the reproduction of a present moment. The sound event recorded magnetically on tape is for a long time resistant to the progress of historical time, as oscillations that seem perpetually dormant are able to emerge once again during replay. Tape recordings of radio broadcasts perpetuate something that was in most cases already recorded on tape by the broadcaster; these recordings thus involve time shifting. Radio as broadcast here means the multiplication of the media archive, which is closer to the model of memetics than technically pure radio, whose signals vanish as soon as they are broadcast.

During a radio broadcast, "live" production and recording are entangled with one another. In this respect, cinematography already distinguished itself from theater in a media-dramatic way. According to Hugo Münsterberg, theater depends on the interpolation of past scenes from memory in order for them to be part of the current dramaturgy, yet the photoplay does not rely on memory. "Suddenly there flashes upon the screen a picture of the past,"[29] and "We have really an objectivation of our memory function."[30] Sigmund Freud wrote shortly before about the "psychic apparatus"; from this time on, human memory was modeled after the technical medium. The language that von Münsterberg chose to describe such time-dramaturgical effects was itself already technical. "The modern photoartist makes use of this technical device in an abundance of forms. . . . Any going back to an earlier scene is called a 'cut-back.'"[31]

The essence of the invariant shifting of recorded time processes reveals itself on tape precisely when the recording of time-based speech and music is

converted into the recording of discrete pulses and the sound or video recording is thus transformed into a data storage technology. The fleeting memory in early computers (and their external "datasettes") required such external magnetic tape recordings. A sonic time figure continues here as sound—namely, as the temporal mode of the sonic beyond actual sound.

Electromagnetically recorded time processes deconstruct the time arrow of physical entropy.

> The stability of a tape recording does not depend on the storage time. The extent to which the playback quality changes over time is only a question of the frequency of use. . . . Furthermore, every remanence (residual magnetism, no matter how slight) of the magnetic heads and tape guides of the devices must be avoided in order to safeguard the playback quality of the tapes.[32]

The alphabet as symbolic notation facilitated the ahistorical transfer of knowledge at the level of coded communication; however, magnetic tape recording enabled the sensory reproduction of presence. Audiovisual presence can be retrieved from magnetic tape reels; the electrical technology of the tape is prepared to convert the latent signals stored on the reels back into audible signals at any time. These signals do not exist as character strings in the sense of printed texts or notes, but rather as a magnetic latency that only takes place in the inductive moment of the passing machine, the unwinding, when it is converted into a signal: a genuine act of time in the processing of sound and image. A privilege of human perception thus migrates into the electronic technology itself.

Magnetic tape recording records the real from signals. The phonograph already performed the same function mechanically. Both cases involve the recording of oscillation processes—the latter kinematically and the former electromagnetically. This already points to a conceptual difference: the distinction between mechanical "grooves" (incisions in phonograph records) and electromagnetic "tracks" (traces in an electrodynamic *and* temporal sense). The temporal development of the tape signal is a function of the unwinding reel; the object of movement (the time signal) is thus accompanied by a self-moving storage medium. The recorded time event is made possible through the event time of the technological medium. Both times are integrally related. However, the static memory modules on microchips contain resident fixed values; a successively stored, digitized event here becomes "visual" in the sense of data that can be addressed as function $f(x, y)$ and described as a matrix. The readout of data takes place either sequentially or in blocks, so that the processor itself is a time machine.

Electromagnetic induction itself, as it has been mathematically calculated since Maxwell, represents a time function of movement on the microphysical

level. In a technically controlled form, it occurs at the ring head of the tape recorder, such as when the microphone records human singing in order to preserve it for future playback in literally electromagnetic latency. This is how the times of culture correspond to the times of electronics. Electromagnetic sampling as sound pickup also occurs in time—a temporally repeatable mode of existence. "Once an event has been recorded the recording is, mysteriously, felt to have more reality than the original. This . . . must be the effect of the instant replay."[33]

When it is played back, a video recording on magnetic tape becomes the present for human perception. Even if the video images are visually noisy, they are perceptually updated at the physiotechnical level of the event—just as early 30-line television image, which were objectively detail-poor as optical signals, were perceived by human eyes as moving image sequences of higher quality. Like a transformer, this dynamic represents a neuronal projection of perception that cognitively overrides defects in the model and thus also the entropic traces of historicity.

Once it is turned on, the tape recorder awaits the input of latent presence, like a radio apparatus set for reception. For electrotechnical systems, it does not matter whether the electromagnetic frequencies are transmitted from the present or played from a tape; in their operative implementation, the past can have no meaning for the technical system. This dynamic proper time behaves anachronistically toward the external time that entropically decays in the objective world.

Is it the noise of early sound and image carriers that constituted the index of the historicity of their media processes? When an antique tube radio is brought back into operation in the present, it receives not music and speech from the time it was built (such as Goebbels' voice as heard on "People's Radio" during the National Socialist period), but rather contemporary medium-wave broadcasts. And when an early television set from 1953 is finally brought back into operation, it displays not the final image it received the moment it was switched off,[34] but rather contemporary programs (provided that the available channels of the apparatus can still be tuned to them).

Electronic storage media *create* presence, as their updated signals are able to address human sensory nerves. The past is thus operatively sublated—another, nonhistorical form of event. Electromagnetic transmission and recording media operate in a transitive, flat time—at the level of their technology (as the sampling of signals in the micromillimeter range) as well as their sensory address to the sense of time. The situation is different with symbolically coded conditions. A city building (provided that it does not emanate an explicitly historical aura) is hardly perceived in its temporal concreteness, even though its duration spans time and it is not a sudden, eventful presence. This durability differs from the sound of a violin in so far as the latter must

be newly created in each present moment. This is a quality that oscillations share with all electronic processes, which are likewise based on oscillators. A continuously standing object is admittedly also a function of subatomic particle waves, yet human sensory thresholds make an absolute distinction between sound and stone.

Sometimes, however, media-technically induced time perception is melancholic. Just as Hamlet stares at the skull of Yorick in Shakespeare's eponymous drama, so too does the media-archeological gaze stare at the reel of a wire recorder from the mid-twentieth century. Human eyes are unable to discern whether the coiled wire stores voices or music, as this is something only the playback machine is able to reveal. The voice of the previous owner might unexpectedly be heard coming from the wire reel during replay. The technical test of the medium thus becomes the time cut(-out). Technology and communication temporally converge here—unlike the case of an antique radio put into operation in the present, where there is a wide temporal gap between the received broadcast and the technical-historical index of the apparatus. The magnetic wire reel sublates the past moment—the latency of storage. Written documents from the Middle Ages also embody a latency, but the decoding and processing of this information is strictly based on the reading ability of humans. In magnetic tape, however, a technological sampling emerges instead, which occurs without humans and which does not read signals hermeneutically, but rather listens to the noise as well. The corresponding technical infrastructure has outlasted all political-historical upheavals for nearly a century—an *epoché* of stable technological conditions of possibility for sound events.

Lacan emphasizes that it is of secondary importance for museums and mausoleums whether their objects are dead or living[35]; what is most important is the presence of a piece of the real. Like the creature composed of body parts in Mary Shelley's novel *Frankenstein*, media signals can be instantaneously brought back to life. Technological apparatuses are never dead, but rather they remain in latency; in order to be media, they need to be charged with electricity and set into operation. From the perspective of a magnetic tape, the playback of a recording is just as authentic today as it would be fifty years ago (provided that the technology remains autonomous)—a time interval, but not "historical" distance. Tape recorded singing represents another sublation of the time of articulation, as it represents written archives or musical scores. In his analysis of technologies of the word, Walter Ong emphasizes that Homer can no longer be asked about ancient singing;[36] it is only possible to understand the mechanism of oral poetry by analogy. However, electrical sound technologies, inspired by telephony, actually allow playback as "re-call"—a conversation with the dead. This culminates technologically in the moment when a voice recorder was placed next to the newly introduced flight data

recorder in 1957; it preserves movement data as well as the last words of pilots before a plane crash.[37] The conversation partners in technical systems are themselves technological.

Magnetic tape requires a theory of time that is appropriate to the medium. A human voice stored on tape (as a further development of the functional principle of electrical telephony) remains electromagnetically latent—like the process of electrostatic photocopying, where a negative charge image emerges for a brief moment. This voice remains silent until it is electrotechnically recalled in the sense of Grimmelshausen's anecdote about Baron von Münchhausen, who froze the sounds of a trumpet in the winter and thawed them out in the spring. Latency time represents a techno-archivistic, unhistorical condition. At the moment of playback, all techno-sonic sounds from the past are pure presence. From the perspective of the electromagnetic pickup, as well as all electron tubes and transistors, it makes no difference whether the signals come from the past (tape) or the present (radio). The moment of their electro-technical actualization is dominated by the present. In both cases, what is taking place technologically is a spatio-temporal de-distanciation; the sound pickup is the reified time window, which is intensified in the gap of the electromagnetic field. What reveals itself here in astonishing clarity is a technological time capsule—electromagnetically sublated time, a media temporality that transcends history.

TIME (ZONE) SHIFT THROUGH MAGNETIC TAPE: TIME TRACKS AND PLAYBACK

The title of Prince's song "Sign 'O' the Times" gets right to the point: studio recordings can be heard and understood as the operative multiplication of temporality with respect to the purely philosophical concept of emphatic, totalizing time. They experiment constantly with new modifications of temporal modes through techno-musical rhythmics. "Time tracks" and "multi-track recording" provide the foundation of possibility for a new time aesthetic, yet at the same time, they also disrupt the perception of the living as soon as a singer is able to sing a duet with himself.[38]

Magnetic tape enables new ways of synchronizing and automating temporalities—particularly in the context of the recording studios of the radio and record industries. This time culture evolves in a literal time zone. The problem of geographical time difference at the macro-temporal level is a counterpart to the phase-shifted echo at the micro-temporal level of magnetic tape. In 1946, entertainer Bing Crosby announced that he wanted to record his radio show. This was a solution to the specifically American problem that programs had to be repeated twice in order to bridge the time zone difference