

SYNCHRONIZATION BETWEEN HUMANS, BETWEEN HUMANS AND NON-HUMANS, AND INBETWEEN NON-HUMANS AT ALL

[Augmented version of lecture at KOSMOS workshop *Emerging Synchronization in Music Cognition*, September 27 to 30, 2017, Humboldt University Berlin, Festsaal Luise]

a) Lecture version

Synchronicity as message of the measuring medium
Synchronization from a media-archaeological perspective
Chrono-technical violence: synchronization
Audio-visual a/synchronicities
Time-critical media operations as implicit chrono-(syn)sonicity

b) Additional thoughts

Resonance and "syntony"
Radio "time signals"
Digital synchronicities
"Social" media synchronization

Synchronicity as message of the measuring medium

Complementary to cognitive studies, the un-affective, media-archaeological analysis of technological synchronization sharpens the awareness of signal processing within the human as well. It is by autocorrelation that the human brain fuses sequential impulses with ultra-short distance into one "tonal" impression in its time-critical, that is: sonic (not acoustic) sense. The musical "consonance" theory can be media-experimentally enacted by EEG measuring; it is the "coincidence neuron" which compares the primary signal with the delayed one.¹ Here, synchronization (German *Gleichzeitigkeit*) actually happens within a fuzzy region of tolerance, since mental pattern recognition is dynamically co-emergent, not a function of a single hidden command organ like an oscillating clock.

This is the moment for Gottfried Leibniz' theory of pre-established harmony which explains how all wordly substances, though autonomous in themselves ("windowless", as defined in his *Monadology*, § 7), still "seem to causally interact with each other because they have been programmed by God in advance to 'harmonize'"². But different from Leibniz' philosophical approach, it is by measuring and modelling media only that this can be techno-mathematically imagined, like the van der Pol oscillator simulating the relaxation moment in neuronal cells with a gas-filled (neon) tube (Thyratron) and slowly charged capacitors which then abruptly discharge.³

There is an incommensurability between phenomenon of synchronization and technological synchronicity. Truly time-critical insight is a function of the

¹ See Martin Ebeling, *Verschmelzung und neuronale Autokorrelation als Grundlage einer Konsonanztheorie*, Frankfurt/M. et al. (Peter Lang) 2007, 52

² Wikipedia entry on "pre-established harmony", accessed September 27, 2017

³ See György Buzsáki, *Rhythms of the Brain*, New York (Oxford UP) 2006, 138 (fig. 139)

measuring media itself: a net of electrodes allows to register the activity of numerous neurons at the same time, resulting in the impression that neurons "fire" in coordinated pace, as "synchronous oscillation"⁴. Such neurological insight into the primordial synchronization of "firing" impulses itself is a function of high-sensitive measuring media; the detection of such a time-critical mechanism, at the limits of laboratory experimentation, requires algorithmic and information-processing mathematical modelling, which makes all the difference between emerging synchronization and synchronicity. The gap opens with "posthuman rhythmatcs" in contemporary popular music culture. Edgar Varèse, in 1936, predicted machines which could generate any arbitrary sound and beat or micro-durational pause - fractions of time in all ratios and exact repetition⁵ - in fact Lev Termen's *Rhythmicon*.

In terms of analysis, the human-machine-constallation is a synchronizing in a different sense, for example the laboratory measuring of human nerve reaction times by the microtime-critical Hipp chronometer in nineteenth century physiological laboratories. Once the human is coupled to the measuring instrument, he or she is synchronized with its inherent temporality; the temporal content of the resulting data looks human, but the message of such time-data is the chronopoetics of the machine itself.

Synchronization from a media-archaeological perspective

Media archaeology, in its reactualization of cybernetic systems theory, analyzes signal transduction both in humans and in machines, while at the same time paying attention to discontinuities and asynchronicities inbetween them.

[There is communication of temporalities, even when machines communicate with machines. Still, such communication is not nonhuman at all, since all such devices are direct artefactual functions of techno-cultural knowledge, this is, they have been created from within the human world.]

While performative "embodied cognition" differs from operative technical *implementation*, time-critical processes within human cognition and within technological systems can be correlated indeed.⁶ Human-machine interfaces increasingly interlace both signal events. Once humans are coupled to processual media, they are coupled to their tempor(e)alities; synchronisation is a forceful coupling in the time-domain.

The media-archaeological approach does not apply neurophenomenological analysis but an object- and process-oriented ontology of synchronization *from*

4 Barbara Hobom, Auf der Suche nach der universellen Sprache des Gehirns, in: Frankfurter Allgemeine Zeitung no. 284, 6 December, 2006, N2

5 "[...] das alles in vorgegebenen Zeiteinheiten, die ein Mensch nie einzuhalten vermöchte": Varèse, as quoted in: Kodwo Eshun, Heller als die Sonne. Abenteuer in der Sonic Fiction, Berlin (ID-Verl.) 2xxx, chap. 6 "Rhythmatische Frequenzen programmieren", 93-110 [EO xxx], 94

6 See Arkady Pikorsky et al., Synchronization. A universal concept in non-linear sciences, Cambridge (UP) 2003

within the technical apparatus. For technologies, there is no "time", since there is no phenomenological perception and "inner time" self-consciousness. Instead, we find a variety and "kosmos" of temporal operations which unfold, the *temporeal*.

Technological reification of time-keeping has resulted in the commodification of temporality itself.⁷ With cinematography as technical operation, in Bergson's criticism of what Heidegger later would call "vulgar time" in reference to the mechanical clock, only the representation of time has become reproducible, while disavowing any relation to temporality as such. In that sense, synchronisation is a coupling and has nothing "temporal" in itself which exists only in the Kantian sense as mental condition (*a priori*) for the human possibility of perception.

Clock-based technical synchronization itself needs to be synchronized: "Through isochronic oscillation the pendulum can exist as the autonomous embodiment of natural or physical time"⁸, while the radio controlled clock needs to be periodically synchronized with a reference clock elsewhere. "The quartz oscillators used in digital electronics (which are used for synchronization rather than timekeeping) can drift [...]" (Reding / Palasti).

Media archaeology is less about the human use of technologies or instruments but about the co-agency of the machine. Some neurons in the human brain tend to "fire" in periodic frequencies and require synchronization in cognitive perception; that induces their modelling by technical oscillators. The moment humans are coupled to a machine / instrument, they become subject (like coupled clock oscillation: Huyghens) to their proper media time (Eigenzeit). This escalates with vibration / oscillating mechanisms which induce resonances within the human sense of time.

The human coupling to humans is performative; the machine coupling to machines is operative. A notorious enactment of the sublime borderlines between synchronicity and asynchronicity is the "phasing" technique applied by Steve Reich in his piece *Piano Phase* from 1967.⁹ This chrono-poetics results from magnetic tape recording and its options for subtle time axis manipulation, while failing when this composition is performed by human pianists. Syn- and Desynchronisation between even the most skilled musicians is always fuzzy, delayed synchronicity. Entrainment analysis between two players itself is a function of time-critical techno-mathematic motion tracking and capturing, with software platform tools like Eyeweb reiterating Marey's chronophotographic measuring of movement more than a century ago. The difference itself is a technological escalation: the option for realtime analysis enabling immediate feedback and modeling for performers as co-agency instead of belated reading of recordings. *Nota bene*, a synchronization algorithm measures data resulting

⁷ See Mary Ann Doane, Has Time Become Space?, in: Liv Hausken (ed.), *Thinking Media Aesthetics*, xxx 2013, 99, referring to: Henri Bergson, *Matter and Memory*, New York (Zone) 1991: 143

⁸ Mackenzie 2001: 244

⁹ David Linden, Das Spiel der "Brain Players. Rhythmen im Gehirn", in: *Junge Akademie Magazin <Berlin> No. 4 (2006)*, 16 f. (17)

from sensors, not movement as it occurs - the Bergsonian critique of cinematography.

[Media-archaeological artefact collections do not simply preserve machine elements but maintain them in a (re-)enactable state. Technical devices are in their media situation only when being in action, that is: signal processing.]

In the media-archaeological perspective on synchronization, there is no *a priori* pre-cognitive notion of time, but rather an inductive departure of analysis from actual technologies; the despotic signifier "time" is replaced by a multitude of operative terms for signal events, such as "resonance" (from the mechanical tuning fork to the electronic resonant circuit); for digital systems. In computing, what is known as the motorical rhythm in humans, is replaced by the clocking of cycling units as precondition for storage-programmed algorithms (Miyazaki).

Chrono-technical violence: synchronization

There is a privileged (all the more deceiving, though) affinity between the human auditory channel, and the frequencies of nerve cell signaling, to technological signal processing. That means, from the engineering perspective, for discussing electronically based communication processes, it makes sense "to use auditory terms [...] like *feedback ... reverberation ... tuning*"¹⁰. "Sonicity" is a neo-logistic term for such an implicit message of "sound" as epistemological object which is primarily not its acoustic content but temporal signal form. From here results the analogy between sonic and media-technical articulations; their common denominator is arbitrarily structured, "dramatized" processuality.

This corresponds with the cybernetics assumption that synchronization in communication between machines (technical *and* mathematical) and animals can be (self-)controlled (Maxwell's "Governor") by time-critical negative feedback processes, as indicated by the subtitle of Norbert Wiener's 1948 publication *Cybernetics or Communication and Control in the Animal and the Machine*. The automatism of feedback differs from asynchronous "editing" of neuronal or technical memory such as film, sound, and video tape which "replaces the linear sequence of events *in time* with events juxtaposed in a time relationship established by the communicator"¹¹.

Classical cybernetic systems theory fell victim to epistemically seductive analogies between timings in technical media and in the human brain, like "clocking"; neurophenomenology rather accentuates the difference between technical and cognitive "timing".

[In the neurophenomenological investigation of the aesthetic experience of music (Helmholtz 1863), temporal structures from neuroimaging data can be analyzed most efficiently when using a *neurodynamic* approach, whereas at present structure- and function-oriented neuroscientific approaches are

10 Schwartz 1974: 23

11 Schwartz 1974: 23

dominant.^{12]}

Simultaneity *unequals* synchronization. Synchronicity, when applied to neural analysis itself, is a technological term, an artefact, since in the human brain or nerve oscillations, if at all, there is never exact clocking. Neuro-science and neuro-informatics separate.

[See Niklas Luhmann, Gleichzeitigkeit und Synchronisation, in: ders., Soziologische Aufklärung 5: Konstruktivistische Perspektiven, Opladen (Westdeutscher Verlag) 1990, 95-130]

[There is an analogy on the discursive level of symbolical time. The cultural concept of (global) history (Kant, Hegel) is a literary, narrative synchronization in the symbolic (the historiographical writing operation) or in the imaginary (philosophy of history), by arbitrarily "agreed-upon chronology"^{13].}

Apart from the phenomenological analysis (Husserl / Bergson) of human cognition (and man-machine communication), there is the phenomenon of "emerging synchronization" *within* technological communication. In media theory, it is appropriate to call such processes "musical" in its archaic sense (ancient Greek *mousiké*), a symptom of which is the frequent use of implicitly "musical" terms for micro-temporal communication by engineers and mathematical theories of technical communication.

Audio-visual a/synchrocities

Phase-delayed signals, consisting of piezo-electric modules, served for the micro-synchronisation of PAL colour television RGB signals (von Bruch's "color clock"), just like the Acoustic Delay Line has been developed for the short-term maintenance of data words in the first electronic computers.¹⁴

This intra-technological delay differs from human sensory synchronization such as the audio-visual perceptual gap since the early times of sound film resulting from the different signal run times of acoustics and light. The media-archaeologically formative epoche of television broadcast technology, before magnetic video recording, just knew "live" transmission; in the meantime, the Marconi Company (GB, 1957) developed the Marconi Telerecording, a recording from screen by film camera with fast intermittent mechanism, while sound was recorded on a synchronized tape recorder with perforated recording material (double tape). In the Dolby Digital cinema system, digital sound information is coded in the space *between* the celluloid film perforation - while the parallel

¹² Jin Hyun Kim, Shaping and Co-Shaping Forms of Vitality in Music: Beyond Cognitivist and Emotivist Approaches to Musical Expressiveness, in: Empirical Musicology Review, Vol. 8, No. 3-4, 2013, 162-172 (168)

¹³ John Durham Peters, Nonsimultaneity, in: same author, The Marvellous Clouds. Towards a Philosophy of Elementary Media, Chicago / London (University of Chicago Press) 2015, 91

¹⁴ See Alan Turing, The State of the Art [1947], in: idem, Intelligence Service, ed. Bernhard Dotzler / Frierich Kittler, Berlin (Brinkmann & Bose) 1987, 183-208 (esp. 186-192)

optical analogue wave form is still continuous. Digital sound recording corresponds with the discreteness of cinematographic projection again which, according to McLuhan 1964, rather relates to the mechanical age than to electronics. But with the digitalization of the sound film, it becomes "silent" film again. A differential synchronicity arises (an oxymoron); in traditional sound film, the acoustic track is 21 frames *in advance* of the actual image, for compensating the gap between acoustic (delayed) and visual signal run time in the moment of cinema projection.¹⁵

In his physiological laboratory equipped with time-critical measuring media, Hermann von Helmholtz detected that the run-time (speed of propagation) of signals in the motoric nerves of a frog counts around 24 meter/sec. This speed reminds of a synchronization problem within humans, when technical audio-visual synchronicity leads to irritation when confronted with physical signal run times in real nature; a lightning stroke is seen more immediate than the accompanying thunder is heard. For the temporal domain of human perception, the media psychologist Herta Sturm once experimentally explored that while every day perception which always includes a slight temporal delay of reaction involving a kind of inner speech ("subvokales Ansprechen"¹⁶), electronic media force their audience into immediate affective response. Immediate media interfaces deprive humans of their natural chance of delayed perception.¹⁷ Does nothing or everything (a Jamesean "stream of consciousness") occur within this half-second?¹⁸ With electronic signal immediacy, humans are deprived of this chance of delay¹⁹. The almost missing micro-temporal gap, is comparable to the essential "time of non-reality" (Norbert Wiener) in digital switching between zero and one.²⁰ There is asynchronicity in signal processing regarding humans on the one hand and electronic machines on the other, a difference in phase delay of signal transfer between technology and human physiology.

[Quasi-technological timing can be detected within human neuroprocessing itself, a kind of chrono-engineering. Pre-emptive activity is what apparently is stimulated in the pre-frontal cortex of the brain which does not simply react to incoming sensations but time-critically tends to anticipation (familiar from the difference between "live" and "real-time" signal transmission within communication media); the a-subjective and the a-human within humans (Gilles Deleuze) is a chrono-technical one.]

15 See Siegfried Kracauer, *Theorie des Films*, Frankfurt (Main) 1960, 158, on "Synchronismus - Asynchronismus"

16 Hertha Sturm, *Wahrnehmung und Fernsehen: Die fehlende Halbsekunde. Plädoyer für eine zuschauerfreundliche Mediendramaturgie*, in: *Media Perspektiven* 1/84, 58-65 (61)

17 Herta Sturm, *Fernsehdictate. Die Veränderung von Gedanken und Gefühlen. Ergebnisse und Folgerungen für eine rezipientenorientierte Mediendramaturgie*, Gütersloh (Verl. Bertelsmann-Stiftung) 1991, 55. See Uwe Sander, *Die "fehlende Halbsekunde"*, in: *Handbuch Medienpädagogik*, Berlin / Heidelberg / New York (Springer) 2008, 290-293 (292)

18 A question posed by Brian Massumi, xxx

19 Herta Sturm, *Fernsehdictate. Die Veränderung von Gedanken und Gefühlen. Ergebnisse und Folgerungen für eine rezipientenorientierte Mediendramaturgie*, Gütersloh (Bertelsmann-Stiftung) 1991, 55

20 See Claus Pias, *Time of Non-Reality. Miscellen zum Thema Zeit und Auflösung*, in: Axel Volmar (ed.), *Zeitkritische Medien*, Berlin (Kulturverlag Kadmos) 2009, 267-282

Time-critical media operations as implicit chrono-(syn)sonicity

Technical con-temporaneity differs from the human or social one. The synchronization in opto-electronic communication between the electronic Cathode Ray Tube camera and the corresponding receiver tube in television is time-critically delicate; otherwise there could be no mass media effect.

In cultural history, *posting* letters, phonographical recordings and cinematography has resulted in asynchronous communication, always in delay between sender and receiver, while simultaneous telephone and radio, in analogue days, have been - in implicit sonicity - "the mechanization of post-literate acoustic space"²¹. The specific "live" modality of broadcast media is synchronicity, ubiquity and differs from the temporal modes of digitally coded communication media which are based on intermediary storage on the micro-temporal level - therefore always delayed against the punctual "now".

Electro-technical synchronization in television image transmission and reception has been replaced by digital signal processing and transfer in realtime; the "live" transmission of images of the American bombing of Bagdad during the Iraq war in the 1990s by the TV channel CNN: "indissociable d'une nouvelle temporalité de la technique d'une autre rythme"²² which is, in fact, not musical but a function of algorithmic pixel calculation.

There is auto-synchronization in the circuitry of human / machine couplings, such as the Bosnia-Montenegrain *guslari* singers of epic verses are coupled to the one-string instrument (the *gusle*) not for the purpose of instrumental amusement of the audience but for servo-motoric feedback in creating the just-in-time prosodic rhythm of oral poetry. Software such as *The Amazing Slow Downer* allows for time-warping and -stretching of reference Jazz-musical recording without altering the pitch (beats per minute). This allows the students to re-inhabit the master solo, *to play in synchrony* with the (recorded) master, in the same frequency (be it in-phase or anti-phase synchrony). What has been the Harmonizer in Kittler's electronic times for time axis manipulation, nowadays is achieved by computational synchronicity; *predictive analytics* is algorithmically counter-calculating the present in real-time, like the Stealth Fighter computationally counter-corrects the physical distortion of the airplane shape which is necessary to deceive the enemy radar beams.

So-called *time-based media* in the traditional sense comprise literature and theatre, then grammophone, film and television. Media archaeology sharpens this notion by focussing on *time-critical* processes as well, where micro-temporal events are crucial for the overall process to happen at all: succeeding synchronization in telecommunication, and clocking within computer data circulation.

The term contemporaneity denotes rather the coming together of different

21 McLuhan, "Five Sovereign Fingers Taxed the Breath" (1954)

22 Jacques Derrida / Bernard Stiegler, *Échographies de la télévision*. Entretiens filmés, Paris (Galilée / INA) 1996, 83

times than simple being-in-the-same-time; technical synchronisation is *forced contemporaneity*. In early image telegraphy, the speed of transmission itself had not been decisive, but rather the synchronization of sender and receiver²³, such as in time-critical electro-mechanical television signal generation and reception of *moving* images.

The time-criticality of synchronism is the moment when a technology is not simply an escalation (literally: further "step") of a cultural technique any more but becomes epistemogenic. In English, *isochronism* signifies "*equal in time, or performed in equal time*", while synchronism refers to "*occurring at the same time, or having the same period and phase*"; the difference is between ontological and operative times. In electro-mechanic archaic television, this resulted in the Automatic Tuning-Fork Synchronizer and the Toothed-Wheel or Phonic-Wheel Motor²⁴; *nota bene*, once more, the use of "sonic" terms in engineering.

There is a difference between physical "presence" experienced by players in computer games (such as in LAN-parties), virtual "presence" (which is realtime calculation for sensomotoric synchronism as condition of the immersion experience in the game) and psychological "presence" in computer games.²⁵ When humans are loosely coupled to a gaming device, they are just contemporary with the machine action.²⁶ But tightly coupled to a computing device in gaming especially, and in ubiquitous computing generally, they become synchronized, subject to techno-mathematical time. In reverse, the machine is programmed in order to adapt to the human asynchronous rhythms, by means of the "interrupt" option which momentarily suspends machine action, waiting for the human input like the radar monitor equipped with a light pen at the CRT of the Whirlwind computer.²⁷

But temporal complexity *within* computing results in functional asynchronicities, such as the different rhythms (clocking) of cycling units.

There is implicit "musicality" in electro-technical timing-as-synchronization; time-critical media operations unfold in implicit chrono-sonicity. The very term "synchonicity" (like Aristoxenos' *chronoi* as time units of poetic prosody) already admits that there is no single transcendent parameter "time". "There is not 'the time', but only clock readings"²⁸; instead of a despotic transcendent signifier called "time", *times* exist only as multitude. Once singular "time" is conceptually replaced by the description of discrete moments (Zenon "arrow

²³ See Christian Kassung / Albert Kümmel, Synchronisationsprobleme, in: Albert Kümmel / Erhard Schüttpeitz (Hg.), Signale der Störung, München (Fink) 2003, 143-165

²⁴ Collins 1932 / 1991, chap. VII, 205

²⁵ See J. Bryce / J. Rutter, In the Game - In the Flow: Presence in Public Computer Gaming. Poster presented at 'Computer Games & Digital Textualities', IT University of Copenhagen, March 2001; http://www.cric.ac.uk/cric/staff/Jason_Rutter/presence.htm

²⁶ See Friedrich Kittler, entry "Flipper", in: same author, Baggersee, Munich (Fink) 20xx

²⁷ See Pias 2002

²⁸ Jürgen Ehlers, Concepts of Time in Physical Theories. Insights obtained and open questions, lecture at conference *On time*, 22-24 May, 2003, Einstein Forum Potsdam

flight" paradox, Aristotle's definition of *chrónos*), time measurements dissolve (in accordance with Bergson's criticism) to position measurements. When "time" implodes, instead we discover, from media-epistemological perspective, the richness of micro-tempor(e)al multiplicities which unfold within high-technological processes.

The very term "synchronization" expresses the arbitrary, techno-logical enforcement of temporal actions, its antonym is "heterochronocity". The term points to the artefactual character of technical *timing* where "time" is not externally attributed to it as a referential quality.

Apart from the apparent "content" (result) of any synchronized action, its McLuhanesque "message" is that there is no time at all, which is only semantically attributed to transcendent signification which exists in culture as symbolic order only. When time comes into existence only by measuring (Aristotle), it is enforcing the symbolical on the real. The difference between symbolical time-ordering (such as narrative) and physical time is essential; different from thermodynamic (Boltzmann), informational entropy (Shannon) needs no term like "time" at all.

Resonance and "syntony"

[In his book *Synchronicity. An Acausal Connecting Principle* (Routledge and Kegan Paul, 1972), psychoanalyst Carl Gustav Jung defines the acausal connection of two or more psychic and physical phenomena, resulting from the archetype as *arché*: a dynamic which - like Leibniz' clock-driven "prestabilizing harmony" - governs human existence.²⁹]

A self-performative form of synchronization is resonance. Martin Heidegger's use of terms from the sonosphere does *not* refer to explicit acoustics (as physical sound event) or to music as conceptual art form in culture, but rather to the implicit, epistemological meaning of sound as vibrating space. In the end of the 1930s, Heidegger defined human existence in resonance with ontological being.³⁰ Heidegger "understood" (German *vernahm*) the *implicitly sonic* nature of such vibrations - not in its acoustic sense, nor as an auditory listening experience. He had to make use of sonic vocabulary as a substitutional way of expressing the microtemporal structure of the "event" of being.³¹

"The resonance principle is not totally new or unique to electronic communication. It has always been an element in painting, music, sculpture, and, to a limited degree, even in print. However, resonance is not a more *operational* principle for creating communication because much of the material

²⁹ See <https://en.wikipedia.org/wiki/Synchronicity>, accessed July 13, 2017

³⁰ "Das Wesen des Menschen [...] schwingt in dem Bezug des Seyns zu ihm. Diese Schwingung meint die unentschiedene Fülle des Entscheidbaren durch das eigene Innestehen des Menschen im Da-sein." (GA 70, 125)

³¹ Rainer Bayreuther, entry "Heidegger und die Musik", in: Heidegger-Handbuch, ed. Dieter Thomä], chapter 2.2 "Auf dem Weg zu einer Akustik des Seyns": 'Stimmung', 'Schwingung', und 'Harmonie' nach Sein und Zeit", 2013

stored in the brains of an audience is also stored in the brain of a communicator - by virtue of our shared media environment."³²

The decisive technical configuration in the emerging epistemology of "radio" communication has been Heinrich Hertz' spark oscillator in correspondance with a "resonator". David Lodge later sonically called this electro-magnetically induced synchronization of distant objects "syntony", which in radio engineering resulted in the technical term *resonant circuit*.³³

[Electronic tele-presence transforms the con-temporary into rigid signal synchronization. In terms of engineering, the electric *resonant circuit* enables radio communication, and only time-critical, exact synchronization of "live" television signal transmission and reception creates the impression of a steady image for the human eye. Only in the cosmic dimension, electro-magnet signal delay becomes visible in the distortion of *moving* targets like astronauts in Slow Scan Television transmission to the observer on earth.]

Electrotechnical synchronization takes place on several levels. Simple electric tuning is achieved by the *Schwingkreis* (resonant circuit), but "sympathetic electric resonance" is an "effect obtained when the electric oscillations which surge in a circuit send out electric waves of a given lenth and these strike a second circuit that is tuned to exactly the same frequency as the first one, so that electric oscillations will be set up in it"³⁴. Damped and sustained oscillations" can be detected: "the energy of the oscillations that are set up in the aerial wire at the transmittiog station is converted into electric waves. When these strike the aerial wire of your receiver they are converted back again into electric oscillations. The receiver detects the *oscillations* that are set up in it, not the electric waves, though it is called an electric wave deetector [...]"³⁵

Radio "Time Signals"

In the difference between the "synchronous" and the "simultaneous", the latter corresponds with McLuhan's notion of "acoustic space". Radio and wireless telegraphy reshaped each other. In World War One, at the Russian front, men listened to the spark acoustics of telegraphy as "radio entertainment". All electro-physical signals are (already) time-functions. In the media-archaeological "pre-history" (*epoché*) of radio before it became a broadcast medium, radio gas been a technology of synchronization: with the radio time signal, the medium message is its content as well, when listened to as communication - before, as a program format radio, this "figure" was pushed back to the "ground" (McLuhan). In 1912, the International Time Conference in Paris inaugurated the network of signalling stations with the Eiffel tower as center. *Watchmakers* once listened to its radio time signals.³⁶

32 Tony Schwartz, *The Resonant Chord*, xxx 1974, 25

33 See xxx Aitken, *Syntony and Spark*, 1976

34 A. Frederick Collins, *Experimental Television*, Boston (Lothrop, Lee & Shepard) 1932; Reprint Bradley, IL (Lindsay) 1991, 205

35 Collins 1932 / 1991: 216

36 See Horace Hurm's *Ondophone* (1914), referred to by Gabriele Balbi / Maria

There has been a re-entry of synchronization within time-keeping itself. With telegraphy in Switzerland, a message could be transmitted in "less than no time" - at least in terms of local sun-dial time. Since mid-19th century Bern local time became federal time in Switzerland: time sent as telegraphic signal ("Einheitszeit"), used in coupling with railway logistics. For other contexts, local time remained partly intact.

Digital synchronicities

The modelling of human neuronal synchronization, since the cybernetic brain-computing metaphor by McCulloch / Pitts and von Neumann, is grounded in the very materiality of digital computing. The fundamental unit of memory, the electro-magnetic relay, for electronic engineers, seemed "naturally adapted to the binary system" since they did not attempt to measure gradations of charge at a particular point but were "content to distinguish two states"³⁷ - which makes all the difference to the time-functional classical black & white television scan line, and to analog computing. The flip-flop as truly binary device provides for the rhythm. Magnetic wires or tapes or acoustic delay line memories recognized "the presence or absence of a pulse or (if a carrier frequency was used) of a pulse train"³⁸. All of the sudden, beyond the phenomenological notion of the continuous endurance of time (Bergson), computer time actually *sounds* different.

The core media-epistemogenic act in interfacing the physical world to numerical computing is analog-to-digital sampling. This signal processing basically consists of an *a priori* synchronisation. By high-frequency clocking (the 44.1 kHz standard for audio, such as for Compact Discs), the signal is first of all time-discretely sampled, before being evaluated ("quantised") in terms of information (measured in bit-depth).

In such concrete chrono-poetical scenarios, media archaeology identifies the digital "shaping of time" (George Kubler). The sample-and-hold mechanism (before the signal actually gets digitally quantised) "stores" its records only for a fraction of a millisecond. Condensers figure among the smallest electro-physical storage elements, and combined with transistors they function as micro-memories here. The electronic sound slice is a temporal being in such electronic circuits, not punctual, but a suspended instant of time as voltage.

"Social" media synchronization

Rikitianskaia in their lecture "The Age of Synchronization", at the conference *Zeitregime und Geschichtswissenschaften* of the Swiss online portal *infoclio.ch*, October 14, 2016, in Bern

³⁷ Section 5.2., in: Arthur W. Burks / Herman H. Goldstine / John von Neumann, Preliminary Discussion of the Logical Design of an Electronic Computing Instrument, in: John von Neumann, *Collected Works*, vol. 5, ed. by A. H. Taub, Oxford (Pergamon Press) 1961, 34-79; reprint in: Swartzlander (ed.) 1976, 221-xxx (227)

³⁸ Burks et al. 1961 / 1976: 227

For radio amateurs, head-phone signal reception had been strictly individual; synchronization of collective reception has a strict electronic condition: the vacuum tube (later transistor) for amplification to operate a loudspeaker.

In times of "social media", the traditional synchronisation of society by radio or TV broadcasting (the simultaneous reception in mass media culture) is replaced by *temporary* synchronisation ("Flash mobs").

The so-called Community Memory project in the San Francisco area has been an early attempt to place networked computer terminals in public places, a telephone-line, Modem- and computer-based social network which emerged around 1970s, figuring centrally a Time-Sharing main frame computer (the SDS 940). What has been "social interaction" among individuals in sociological terms has become cold synchronization.³⁹ The media-archaeological condition for enabling such *online* social synchronization has been the magnetic core memory in the central main frame computer. This binary grid is no metaphor on neuronal data processing any more.

³⁹ See Stefan Höltgen, "All Watched Over by Machines of Loving Grace". Öffentliche Erinnerungen, demokratische Informationen und restriktive Technologien am Beispiel der "Community Memory", in: Ramón Reichert (ed.), Big Data. Analysen zum digitalen Wandel von Wissen, Macht und Ökonomie, Bielefeld (transcript) 2014, 385-403 (386)