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Forgetting / Cybernetics

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Abstract

This article aims to trace epistemological connections between cybernetics and German media theory by emphasizing the notion of *forgetting*. This notion is presented as a central condition for problematizing, first, the human-machine coupling pointed out by cybernetics and, second, the rise of the machines that has concerned German media theory for decades. To this end, the article draws a line connecting an early text by Friedrich Kittler and Heinz von Foerster's work on memory—a connection that will also be discussed in the light of findings and statements by Moritz Hiller and Jan Müggenburg. Finally, this article will outline a (still hypothetical) way to problematize the techno-epistemological scope of Project Cybersyn through the lens of such a notion.[1]

[1] This is an updated version—mostly in terms of language and structure, but also slightly in terms of content—of an article published in early-2020 in the first issue of Chronus Art Center's *CAC/CAFAcat Editorial* journal. Diego Gómez-Venegas, "Forgetting / Cybernetics. History of Media Studies," *CAC/CAFAcat Editorial* 1, no. 1 (2020). Republished with permission. This article is also part of the author's doctoral research on Project Cybersyn, developed at the Institute for Musicology and Media Studies, Humboldt-Universität zu Berlin.

In 2013, a large group of scholars gathered at New York University's Deutches Haus to commemorate the work and life of the late media theorist Friedrich Kittler. There, Bernhard Dotzler, who gave the only German-language presentation[2] of what would later be translated as *Idiocy, Forgetting, and Outdatedness,*[3] emphasized what he calls Kittler's "avant-gardism." Namely, the approach that the author of the *Aufschreibesysteme* unfolded—there, in the now distant days of the late-1970s—by declaring that it was already "time for other stories."[4] Accordingly, by moving beyond and somehow escaping from literary studies, Kittler would pave the way for what would later be known as German media theory—the field that would remain recursively connected to cybernetic thinking from its foundations.[5] Thus, through an intervention that forced his audience to automatically switch languages for encoding and decoding on the fly, or simply invited them "to feel free to leave,"[6] Dotzler reminds us of the structural centrality of the notion of *forgetting* in Kittler's radical move.

In that spirit, this article will look back to a time before the publication of Kittler's pivotal habilitation thesis, *Discourse Networks* [*Aufschreibesysteme*],[7] and will pay particular attention to Dotzler's remarks in order to trace the nodal point that would help us to witness, to understand, and ideally to problematize, the connection between cybernetics and German media theory. But this will also imply looking at Moritz Hiller's research[8] when he claims that, contrary to what Kittler later claimed,[9] the founding discussion around the notion of *Discourse Networks* was neither influenced by Shannon's mathematical theory of communication,[10] nor was a "free application"[11] of it. Rather, as Jan Müggenburg has pointed out,[12] it was rather a development influenced by an early familiarity with the work of cyberneticians such as Heinz von Foerster.

Consequently, the central issue that this article seeks to address lies in the fact that, beyond any implicit emphasis on the *transmission* and *processing* functions of media technology that Friedrich Kittler had deployed by stressing, with Shannon, the role of statistics, probabilities, noise, and channel, the actual operation that activated the link between German media theory and cybernetics would be the *problem of memory*. In other words, given that "transfer and storage are two sides of one coin,"[13] as Wolfgang Ernst has pointed out, what seems to define not only the link between cybernetics and German media theory, but perhaps the very essence of each of these fields, is the key ambivalence between *transmission* and *storage* that media technologies produce. Therefore, the human-machine coupling—insofar as it is understood here as a central object of research for both cybernetics and German media theory—will be considered in these

[2] See Bernhard Dotzler, "The Sirens Go Silent - Friedrich Kittler Part 11: Bernhard Dotzler," filmed March 2013 at Deutsches Haus at NYU, New York, NY, video, 48:34, https://youtu.be/_uZJg8lwfJU.

[3] See Bernhard Dotzler, "Idiocy, Forgetting, and Outdatedness: Friedrich Kittler's Avant-Gardism and the 'Time for Other Stories'," in *The Technological Introject: Friedrich Kittler between Implementation and the Incalculable*, eds. Jeffrey Champlin et al (New York: Fordham University Press, 2018), 35–45.

[4] Friedrich Kittler, "Forgetting," *Discourse* 3 (1981[1979]): 116; quoted in Dotzler, "Idiocy, Forgetting, and Outdatedness," 38.

[5] See Jan Müggenburg, "Bats in the Belfry: On the Relationship of Cybernetics and German Media Theory," *Canadian Journal of Communication* 42 (2017): 467–84.

[6] Dotzler, "The Sirens Go Silent - Friedrich Kittler Part 11," 2:22.

[7] See Friedrich Kittler, *Aufschreibesysteme 1800/1900* (München: Fink, 1985). Also, see Friedrich Kittler, *Discourse Networks 1800/1900* (Stanford: Stanford University Press, 1990).

[8] See Moritz Hiller, "Unter Aufschreibesystemen: 'Eine Adresse im Adressbuch IC der Kultur,'" *Metaphora* 1 (2015): II/1–26.

[9] See John Armitage, "From Discourse Networks to Cultural Mathematics: An Interview with Friedrich A. Kittler," *Theory, Culture & Society* 23, no. 7-8 (2006): 17–38.

[10] See Claude E. Shannon and Warren Weaver, *The Mathematical Theory of Communication* (Urbana: University of Illinois Press, 1998 [1949]).

[11] Armitage, "From Discourse Networks to Cultural Mathematics," 19.

[12] See Müggenburg, "Bats in the Belfry," 475–78.

[13] Wolfgang Ernst, "Archives in Transition: Dynamic Media Memories," in *Digital Memory and the Archive* (Minneapolis: University of Minnesota Press, 2013), 100.

pages as the actual manifestation of the aforementioned nodal point; i.e., as the true embodiment of the scope of cybernetics, and even more so, of its entangled existence around and within German media theory. Thus, the sentence "Media determine our situation,"[14] one of Kittler's most well-known statements and perhaps the (deceptive) starting point of his explicit analytical program on media technologies, can find its rationale a few hundred pages back.[15] Paradoxically, despite the warning of the Berlin School of Media Archaeology and, of course, of Kittler himself, it is through the study of written texts that this article will address these questions. For this reason, what follows should not necessarily be seen as a media archaeology, but rather as a kind of genealogy.

Forgetting

In 1979, in a small anthology entitled *Texthermeneutik: Aktualität, Geschichte, Kritik* [Text-Hermeneutics: Present, History, Critique], the 36-year-old (still) literary scholar Friedrich Kittler presented an article succinctly titled *Vergessen* [Forgetting].[16] Two years later, in 1981, an English translation appeared in the US journal *Discourse.*[17] There, Kittler laid out an early set of arguments that, as the recursion of time now reveals, would not only outline a critique of the traditions that sustained the field that demarcated the scholar's own position at the time, but would also constitute an act of radical departure that would, in turn, mark the attempt to draw a new field—a field whose boundaries would be as fragmented as to seek and promote the struggle between the old world of letters and the not-so-old realm of circuits. Such a task, however, begins by looking at Nietzsche. It is in the work of the (first) philosopher and (then) genealogist that Kittler finds the thread to begin weaving the notion of *forgetting* as a key element for understanding the media-conditioned scope of the processes of memory in contemporary cultures. Interestingly, this connection invoked an *untimely*—perhaps a too early one[18]—reflection on the then impossible systems of control and communication between the animal and the human being:

> The human being might ask the animal: 'Why do you just look at me like that instead of telling me about your happiness?' The animal wanted to answer, 'Because I always immediately forget what I wanted to say'—but it had already forgotten this answer and hence said nothing, so that the human being was left to wonder.[19]

Kittler thus embarks himself on a project, on a journey, that will lead him to analyze the techniques and technologies that would allow humans to distance themselves from other animals: speaking, reading,

[14] Friedrich Kittler, *Gramophone, Film, Typewriter* (Stanford: Stanford University Press, 1999), xxxix.

[15] The above quote—"Media determine our situation"—marks the actual beginning of Kittler's book *Gramophone, Film, Typewriter*, and so it could be argued that all the reasoning that supports such a statement is to be found in the remaining chapters and pages of that book. Even more, it could be also argued that this work marks the beginning of Kittler's second period—the one concerned with media technologies—and thus, that the cybernetic strands of his work must be found there. This article contends, however, that it is his earlier work that draws the theoretical complex that, as a *hinge* between his literary and media theoretical periods, points to Kittler's cybernetic program. On Kittler's periods, see Geoffrey Winthrop-Young, "Introduction," in *Kittler and the Media* (Cambridge: Polity Press, 2011), 1–7.

[16] See Friedrich Kittler, "Vergessen," in *Texthermeneutik: Aktualität, Geschichte, Kritik*, ed. Ulrich Nassen (Paderborn: Ferdinand Schöningh, 1979), 195–221.

[17] See Kittler, "Forgetting."

[18] In the German article, *Vergessen*, Kittler cites Nietzsche's work *Vom Nutzen und Nachteil der Historie für das Leben* [On the Utility and Liability of History for Life] from the collection *Unzeitgemässe Betrachtungen* [Unfashionable Observations, or Untimely Meditations], which was originally published in Leipzig in 1874. However, in the English translation of this article, *Forgetting*, the editors of the journal *forgot* to use the already translated and published English version of Nietzsche's work, and instead allowed the translators to automatically translate—that is, without paying attention to already archived storage devices—the quote in question. In this article, as it will be seen below, such a particular act of *forgetting* is challenged.

[19] Friedrich Nietzsche, "On the Utility and Liability of History for Life," in *Unfashionable Observations* (Stanford: Stanford University Press, 1995), 87.

writing, and thus *storage devices*. "So," Kittler argues, "it is only on paper that the 'human being' originates, this being, *per definitionem* distinct from the animal."[20] In other words, what preoccupies Kittler in the ante-penultimate decade of the 20th century, are the material processes that not only define the human condition, but even more so configure the transitions and transformations of such a condition. For if these material processes, these techniques and technologies, change, then it is not only not strange, but expected, that human beings will also change as a consequence.

[20] Kittler "Forgetting," 90.

However, the German scholar's main concern is that these elements have historically been taken for granted, as if "memory [were] considered an attribute or even a peculiarity of the 'human being.' "[21] But on the contrary, precisely because we forget, and moreover because we have entrusted our memory and knowledge to what he calls "storage devices" and "mnemo-techniques,"[22] Kittler initially sees in discourse analysis—not only Foucault's, but also Nietzsche's—the procedure for inquiring into these *writing systems*. But such an approach also implies a critique, and thus it is possible to argue that another mode of analysis must underlie the researcher's general program:

[21] Kittler "Forgetting," 90.

[22] Kittler "Forgetting," 90.

> Discourse analysis, by contrast, means to let the 'human being' be. I forget every day whether I forget or remember. But that is not the question. The question is where and how those memory systems function that philosophy ascribed to the 'human being.'[23]

[23] Kittler "Forgetting," 90.

And later, *literally* announcing his departure, he continues:

> Archives themselves provide plenty of material to archivize. Only imperial myths propagate the belief that sentences are eternal once they have been hewn into stone, once they have become lapidary. No storage device operates in isolation. Archives are hooked up with other archives, directly or via interfaces, and are themselves archivized in other archives. Archives require input and output stations (even if these be just sense organs and brains). Archives contain mechanisms that bring about and/or prevent the erasure of their data. The development of electronic computers has merely provided precise terms and circuit diagrams for factors which come into play in all cases of archivizing.[24]

[24] Kittler "Forgetting," 93.

For Kittler, therefore, no more simple discourse analyses—as if that had ever been the case—because even archives have to operate in networks in order to avoid *forgetting*, or rather to prevent us humans from doing so. Ironically, however, insightful Friedrich knows that not everything has been said or written. This is because Kittler's main criticism of Foucauldian discourse analysis is precisely what the old-fashioned "archeologist simply forgot"[25]: that in the 20th century such networks went far beyond books and letters. Thus, in 1979, just

[25] Friedrich Kittler, *Gramophone, Film, Typewriter* (Stanford: Stanford University Press, 1999), 5.

as he would put it almost 15 years later[26] in the midst of his media-analytical phase, Kittler refers to computer data storage devices as the actual material manifestation of the processes that regulate the circulation of information—at that time still mostly characterized as knowledge—in modern cultures. According to the fugitive literary scholar,[27] programmable read-only memories (PROMs), on the one hand, and random-access memories (RAMs), on the other, become the key operational model and thus a critical media-epistemological way to characterize the flow, the circuit, the exchange of information between archives and human beings. Since PROMs are the set of deeper permanent instructions to initiate operations within the system, and RAMs are the devices to store only the necessary data to operate in the present, this new coupling between humans and archival (information) systems emerges as conditioned by the ambivalent nature of a programmable permanence and a permanent transition.[28]

> People, once simply PROM's who were programmed once and for all through baptism, village schools, and the order of estates, became RAM's. In order to supply storage space for new books, new knowledge, new programs, information had to be made erasable—and according to Nietzsche understanding is the erasure of signifiers.[29]

In other words, what Kittler is able to discern at this early stage of his career is that when, in the mid-1900s, archives become technological information systems, the only thing that remains permanent is not knowledge but the commands to access it—the entry barriers or protocols—and then knowledge itself becomes information that is constantly erasable and rewritable—that is, *forgettable*. What is more, by being plugged into these systems, our very being as humans becomes not only a product, but the embodiment of such a technological *forgetting*. Whereas in earlier epochs, in many cultures, people were encouraged, if not forced, to learn by heart the knowledge they could acquire from the archives and storage devices to which they had access—i.e., libraries and books—in modern times, not only the ever-increasing amount of information, but also the very techno-logical structures that sustained it, would have turned people into RAM modules. From then on, the very act of searching for the desired information implied running the protocols that would make this procedure possible, and looking for the requested data points one address *at a time.* But since all the many addresses and data points that would have to be consulted before a successful search could be carried out would occupy valuable and limited memory capacity, such *at a time* would always imply *forgetting* the previously registered data, and then it would also literally mean operating in

[26] See Friedrich Kittler, "The World of The Symbolic – A World of The Machine," in *Literature, Media, Information Systems*, ed. John Johnston (Amsterdam: OPA Amsterdam B.V., 1997), 133. See also Friedrich Kittler, "Die Welt des Symbolischen – eine Welt der Maschine," in *Draculas Vermächtnis. Technische Schriften* (Leipzig: Reclam, 1993), 62.

[27] According to Moritz Hiller, by 1976—the year in which Friedrich Kittler would have first publicly referred to his research subject in technological terms—the scholar would have already spent years experimenting with electrotechnical media. See Hiller, "Unter Aufschreibesystemen," II–8.

[28] See Ernst, "Archives in Transition," 99.

[29] Kittler "Forgetting," 99.

one and only one time—as in a random-access memory, in a present that unfolds as presence.

Then, people learn to learn by technologically *forgetting*. Here seems to lie the cybernetic core of Friedrich Kittler's media theoretical program.

In this regard, there are two paths that might show that the emergence of this program may also respond to concrete connections between the fields in question—literary studies and cybernetics. Thus, following what Jan Müggenburg has shown,[30] this article argues that both of these paths, as the conjecture has it, lead to Heinz von Foerster's work on memory.

On the one hand, and even beyond the particularly precise conceptual coincidence, Kittler's "Forgetting" offers a specific indication that allows this article to strongly suggest that Kittler might have indirectly referred to von Foerster's lecture *Quantum Mechanical Theory of Memory*[31] in his arguments. Comparing the library system with computational memories and procedures, and further referring to a "cunning reader" or user of such a library, who in the scholar's view "is an address selector of the sort that is hooked up to the latest generations of IBM computers," Kittler adds that when this search system overcomes "harmless books" and libraries, "the [computational] address selector equipped with a *randomness generator* sends the incoming data to *free positions*, the exact address of which does not appear at any of the many output stations."[32] It is precisely this techno-logical explanation—the one with *randomness generators* and *free positions*—that gives this article the space to unfold its conjecture.

What Heinz von Foerster, the Austrian-American cybernetician, presented in the aforementioned lecture at the Macy Conferences in 1949, was the outline of a theory of memory in three steps: the phenomenological (explained by quantum mechanical means), the psychological, and the biophysical.[33] The second step—which may have been of particular interest to Kittler given his ongoing attention to poststructuralism and psychoanalysis[34]—explains diagrammatically how the mental procedure by which a human being memorizes a series of nonsense syllables would work. Such a procedure is defined by this nonsense information being "fixed on a certain carrier, many of which may be in the brain ready to be impregnated by such an elementary impression."[35] Von Foerster calls these ready-to-be-impregnated elements "free carriers,"[36] and goes on to point out that it is possible to "assume that such a carrier is not able to carry forever its impregnation but only during a certain time and decays after time to a free carrier."[37] In other words, if *nonsense syllables* are tantamount to *random data*, which is sent to *free positions* or *carriers*, then Kittler's early media theory of *forgetting* could have found its origin

[30] Although Jan Müggenburg emphasizes the fact that cybernetic thinking and theories became popular among German postmodernists in the 1980s, thus influencing German media theory from then on, he also points out, following Moritz Hiller (2015), that Kittler may have received the influence of cybernetics indirectly, already in the 1970s, through the works of Watzlawick, Luhmann, and Schmidt. However, this article suggests that Kittler may have been directly exposed to the work of Heinz von Foerster already in that decade, obscure and indirect references notwithstanding. See Müggenburg, "Bats in the Belfry," 475–78.

[31] See Heinz von Foerster, "Quantum Mechanical Theory of Memory," in *Cybernetics | Kybernetik: The Macy-Conferences 1946-1953. Volume I / Band I. Transactions / Protokolle*, ed. Claus Pias (Zurich-Berlin: Diaphanes, 2003), 98–121.

[32] Kittler, "Forgetting," 94. [Emphasis in the published English translation. However not present in the original in German].

[33] See von Foerster, "Quantum Mechanical Theory of Memory," 98.

[34] Kittler, "Forgetting," 94.

[35] von Foerster, "Quantum Mechanical Theory of Memory," 100.

[36] von Foerster, "Quantum Mechanical Theory of Memory," 101.

[37] von Foerster, "Quantum Mechanical Theory of Memory," 101.

right at the dawn of cybernetics. And, of course, this correlation, this conjecture, does not simply obey the interpretation of meanings, or even the equivalence of syntactic structures, but the exact matching of characters. Says von Foerster:

> Some time ago I was trying to work out a relation between the physical and the psychological time. Certainly, both these times would be proportional to each other if our memory would work like a tape-recorder: any incoming information would be stored indefinitely. Recall of a certain event would give exactly the same time structure as previously observed. We know, however, that isn't so. As time elapses we lose a certain amount of information by forgetting. Hence I tried to start with a simple theory of forgetting.[38]

[38] von Foerster, "Quantum Mechanical Theory of Memory," 98.

What is more, in his lecture the cybernetician argues that in order to develop such a theory, he needs "a psychological process which deals with impressions of which the elements are as independent as possible of each other."[39] Interestingly, von Foerster finds his case study—and this point takes this article already to the second path of its argument—in the work on memory developed by the German psychologist Hermann Ebbinghaus.[40]

[39] von Foerster, "Quantum Mechanical Theory of Memory," 98.

[40] von Foerster, "Quantum Mechanical Theory of Memory," 99.

As Moritz Hiller points out, while the first part of Friedrich Kittler's seminal work *Aufschreibesysteme* [Discourse Networks] was practically finished by 1976, the second part, on "the language of technical communication," would be written "between the end of 1979 and May 1982."[41] In other words, the article *Vergessen*, published around July 1979,[42] could be read as the epistemic hinge that draws the radical turn that characterizes Kittler's work, and perhaps the new field of German media theory as a whole. For, once again in the case of the *Aufschreibesysteme*, one can observe that Kittler devotes an entire section of the second part of this book to Ebbinghaus's psychophysics:

[41] Hiller, "Unter Aufschreibesystemen," II–10. [Translation by the author].

[42] See Ulrich Nassen, "Vorwort," in *Texthermeneutik: Aktualitat, Geschichte, Kritik*, ed. Ulrich Nassen (Paderborn: Ferdinand Schöningh, 1979), 7.

> Nietzsche and Ebbinghaus presupposed forgetfulness, rather than memory and its capacity, in order to place the medium of the soul against a background of emptiness or erosion. A zero value is required before acts of memory can be quantified. Ebbinghaus banned introspection and thus restored the primacy of forgetting on a theoretical level. On the one hand, there was Nietzsche's delirious joy at forgetting even his forgetfulness; on the other, there was a psychologist who forgot all of psychology in order to forge its algebraic formula.[43]

[43] Kittler, *Discourse Networks*, 207.

As Heinz von Foerster pointed out in his 1949 Macy Conference lecture, he would "use results observed by Ebbinghaus during his study of the forgetting process" where "the experimenter teaches a group of subjects 100 nonsense syllables until everyone knows these syllables by heart."[44] According to von Foerster, the experimenter would have examined the subjects daily, plotting the number of syllables

[44] von Foerster, "Quantum Mechanical Theory of Memory," 99.

remembered on a graph whose baseline would be a function of time. Thus, if "any observed event leaves an impression which can be divided into a lot of elementary impressions," where "any event leads initially to number N_o of elementary impressions," then it would be possible to state that "[a]fter a certain time t the number of existing elementary impressions may be called N." What the cybernetician is looking for, then, "is a function which connects the number N with number N_o and the time t," that is to say, the "forgetting-coefficient."[45]

The human being forgets, and such a process can be scientifically quantified in order to know exactly both the amount of information that can be humanly memorized—either consciously, unconsciously, or hallucinatorily,[46] and the time it takes for this information to disappear from our being. And what Friedrich Kittler knew in his all-too-contemporary journey was that, ironically, in order to control the forgetting-coefficient, the only resource left to humans was to be permanently coupled to machines whose internal operations were based precisely on processes of *forgetting*—"[t]his is how electronic memories forget the 'human being.' "[47]

[45] von Foerster, "Quantum Mechanical Theory of Memory," 98.

[46] von Foerster, "Quantum Mechanical Theory of Memory," 105.

[47] Kittler, "Forgetting," 94.

Cybernetics

Therein lies the paradox that runs through cybernetics and German media theory—a paradox that prevents us from answering in a single movement whether such a coupling would respond to a case of negative or rather positive feedback. And just as Norbert Wiener—one of the founding fathers of cybernetics—acknowledged J. Clerk Maxwell's paper on governors as a cornerstone in the prehistory of this interdisciplinary field,[48] perhaps this article will benefit from a brief digression to try to prove how rooted the idea of *forgetting* might be in cybernetics.

Although Maxwell's work on governors—the mechanical devices used in the 18th and 19th centuries as "regulators of machinery"[49]—is more clearly related to the realm of physics and mechanical engineering, its conceptual scope can shed some light on the issue of feedback in the way it is discussed here. Accordingly, this work will prove essential in the long run for measuring the extent of cybernetics[50] and, more importantly here, the human-machine coupling in which *forgetting* operates. Maxwell offers a conceptual distinction between *moderators* and *governors*. In the former, the "the corrective action [. . .] is directly proportional to [the] overspeed"[51] to be regulated in a given machine, this process of regulation thus being prone to receive the internal malfunctions of the machine in question. The latter, on the other hand, the actual object of Maxwell's interest,

[48] See Norbert Wiener, "Introduction," in *Cybernetics: or Control and Communication in the Animal and the Machine* (Cambridge: MIT Press, 1985 [1948/1961]), 11.

[49] See J. Clerk Maxwell, "On Governors," *Proceedings of the Royal Society of London* 16 (1867-1868): 271.

[50] See Otto Mayr, "Maxwell and the Origins of Cybernetics," *Isis* 62, no. 4 (1971): 424–44.

[51] Mayr, "Maxwell and the Origins of Cybernetics," 427.

would be those devices constituted by an "additional [and independent] mechanism that translates any output error into a corrective action that increases steadily until the output error has entirely disappeared."[52] This description offers us an interesting point of reflection, because if such independent devices are conceptually equivalent, or at least similar, to the carriers that are "not able to carry forever its impregnation but only during a certain time," which then decay and become "a free carrier,"[53] ready to be impregnated by the immediately following amount of information—as if the previous one had never existed—it would be fair to argue that the essential structure of the notion of *forgetting* can already be found in the early rise of machines, whose increasing autonomy cybernetics described and helped to improve. If this is the case, then perhaps it would be possible to say that what cyberneticians like von Foerster did was to identify a kind of autonomy whose operational nature was already present in human biological behavior—an operational nature that scholars like Kittler would later place at the center of an enterprise aimed at updating the humanities, by redescribing the human condition itself.

When Norbert Wiener, the Mexican physician Arturo Rosenblueth, and Wiener's research assistant Julian Bigelow wrote *Behavior, Purpose and Teleology*[54] in Cambridge, Massachusetts, in 1943—more than 70 years after Maxwell's paper on governors—an early yet inevitable problematization and categorization of the human and machine (co-)existence was set in motion. Through a conceptual analysis of behavior, the authors sought to emphasize the role of purpose and the importance of negative feedback—teleology in their terminology—in constructing a transversal understanding of the modes in which both organisms and machines respond to their environment, and pursue goals in such a context.[55] Thus, cybernetics begins to emerge as an analytical way of thinking that focuses on the becoming of the entities that populate this world, in which biological and machine structures not only merge, but also recursively explain each other.[56] Moreover, the contribution of Maxwell's study of governors to science in general drew a thin but strong line that allowed these 1940s researchers to argue that every purposeful behavior in the world is driven by negative feedback; i.e., by "the margin of error at which [an] object [or organism] stands at a given time with reference to a relatively specific goal,"[57] where such an error is informed by the output of the object-organism, and the margin is then fed back to it in the form of input. Consequently, even if these researchers would state that, unlike human organisms, "[l]earning and memory" in machines would remain "quite rudimentary" for a while, what Heinz von Foerster proposed six years later with his "forgetting-coefficient" should be seen here as a substantial escalation of the Massachusetts team's argument.

[52] Mayr, "Maxwell and the Origins of Cybernetics," 427.

[53] von Foerster, "Quantum Mechanical Theory of Memory," 101.

[54] See Arturo Rosenblueth, Norbert Wiener, and Julian Bigelow, "Behavior, Purpose and Teleology," *Philosophy of Science* 10, no. 1 (January 1943): 18–24.

[55] See Rosenblueth, Wiener, and Bigelow, "Behavior, Purpose and Teleology," 24.

[56] See Rosenblueth, Wiener, and Bigelow, "Behavior, Purpose and Teleology," 22.

[57] Rosenblueth, Wiener, and Bigelow, "Behavior, Purpose and Teleology," 19.

The question remains, however, whether von Foerster's and Kittler's *forgetting* would obey purposeful behavior in the long run. For both the cybernetician and the media theorist would assert that such a process, *forgetting*, prevails even in unconscious behavior. On the one hand, von Foerster argued that in the human organism "sensory receptors" can also be seen as "short-term" carriers "which transmit consciously or unconsciously their impregnation immediately to the carriers"[58] of the memory; an argument that, from the point of view of this analysis, renders unclear the existence of a control mechanism that regulates the margin of error between the output of the human body and its eventual goal, if it does not simply declare its absence—all this, of course, with the understanding that the cybernetician did not really discuss the human-machine coupling in his lecture at the Macy Conference, but only human memory by cybernetic means. On the other hand, Kittler would explicitly "attach" machines to the human body in order to develop his approach to *forgetting*. In this line, he will insist on that such a process requires acknowledging that "consciousness is only the imaginary interior view of media standards."[59] In other words, Kittler's media theoretical program even radicalizes cybernetics by not only suggesting but stating that humans have delegated the control mechanisms that regulate the difference between their outputs and purposes—voluntarily or not, consciously or not—to machines. "Le monde symbolique, c'est le monde de la machine,"[60] Kittler wrote in *Vergessen*, because, as he well knew, by the 1970s Ebbinghaus's nonsense syllables had already been replaced, through the materialization of "presence and absence,"[61] by ASCII series of seven or eight bits. Nevertheless, the question remains: How is it that such an apparently unconscious technological delegation—given that it operates as a continuous feedback—avoids the emergence of "clumsy behavior" derived from the feedback, which becomes "positive instead of negative for certain frequencies of oscillation"?[62]

Thus, the human might have asked the machine: Why are you just reading my output like that instead of telling me about your presence? But the human, unconsciously, had already forgotten about awareness and such presence, and so said nothing—leaving themself to wonder.

[58] von Foerster, "Quantum Mechanical Theory of Memory," 105.

[59] Kittler, "The World of The Symbolic – A World of The Machine," 132.

[60] Jacques Lacan, *Le séminaire II: Le moi dans la théorie de Freud et dans la technique de la psychanalyse* (Paris: Le Seuil, 1978), 63, quoted in Kittler, "Vergessen," 202.

[61] Jacques Lacan, "Psychoanalysis and cybernetics, or on the nature of language," in *The Seminar of Jacques Lacan, Book II, The Ego in Freud's Theory and in the Technique of Psychoanalysis 1954-1955*, ed. Jacques-Alain Miller, trans. Sylvana Tomaselli (New York: W.W. Norton & Company, 1991), 303.

[62] Rosenblueth, Wiener, and Bigelow, "Behavior, Purpose and Teleology," 20.

Cybernetic Synergy

Turing tests aside,[63] it is worth insisting on and recalling that the problem of memory, both in "the animal and the machine," has concerned cybernetics since its nominal foundation: "A very important function of the nervous system, and, as we have said, a function

[63] See Alan M. Turing, "Computing Machinery and Intelligence," *Mind: A Quarterly Review of Psychology and Philosophy* 59, no. 236 (October 1950): 433–60.

equally in demand for computing machines, is that of *memory*, the ability to preserve the results of past operations for use in the future."[64] But as Norbert Wiener also knew—in the wake of Alan Turing's work[65]—on the radical threshold of this machine-driven era that he so eloquently analyzed and described, a correlation between past and future could only be activated through the mediation of a memory that could "record quickly, be read quickly, and be erased quickly."[66] In other words, already in the 1940s, if not even in the previous decade,[67] the forerunners of cybernetics understood that any "permanent record" that was to constitute an analytical source for "future behavior,"[68] had to be processed through technologies of erasure. Even more, Wiener argued that just as a "short-time memory" could be implemented in electrical circuits by using devices such as "*telegraph-type repeaters*,"[69] there was already sufficient evidence at that time "to believe that [something similar] happens in our brains during the retention of impulses."[70]

However, despite any possible implicit connection between the developments unfolded in Princeton, (any) Cambridge, or Manchester, the explicit articulation and inclusion of the notion of *forgetting* as a key element of the field of cybernetics is done only by Heinz von Foerster.

The Austrian-American cybernetician reaffirmed this premise during his later days in Pescadero, California, in the preface to his book *Understanding Understanding* (2003). Given that it is only through learning and understanding that it is possible to discover that "one forgets an amount of data proportional to the amount of data one has in store at any one time," a truly mathematical mind would conclude very early, even as a schoolboy, that such a proportion "corresponded to some sort of logarithmic decay of memory."[71] Moreover, since it is only by browsing through bookshelves[72] that one arrives at the material proof of the fact that the operations of the human mind can be interrogated by algebraic analyses, and thus that it responds to them—such as in "a graph showing a decaying line labeled 'Ebbinghaus's Forgetting Curve' "[73]—the epistemological core of cybernetics cannot be disassociated from a genealogy of knowledge and its apparatuses.

Thus, apart from the experiments of the psychologist Hermann Ebbinghaus, when it comes to cybernetic apparatuses as such, it might seem that there are not many applied cases that can help us to genealogically and archaeologically investigate how the operational constitution of the human-machine coupling—perhaps the main condition of contemporary media cultures—is based on the cybernetic operation of *forgetting*. There is, however, at least one case that is useful.

[64] Norbert Wiener, "Computing Machines and the Nervous System," in *Cybernetics: or Control and Communication in the Animal and the Machine* (Cambridge: MIT Press, 1985 [1948/1961]), 121. [Emphasis in the original].

[65] See Wiener, "Computing Machines and the Nervous System," 125.

[66] Wiener, "Computing Machines and the Nervous System," 121.

[67] See Alan M. Turing, "On Computable Numbers, With and Application to the Entscheidungsproblem," *Proceedings of the London Mathematical Society* s2-42, no. 1 (January 1937): 230–65.

[68] See Wiener, "Computing Machines and the Nervous System," 121.

[69] Wiener, "Computing Machines and the Nervous System," 122. [Emphasis in the original].

[70] Wiener, "Computing Machines and the Nervous System," 122.

[71] Heinz von Foerster, "Preface," in *Understanding Understanding: Essays on Cybernetics and Cognition* (New York: Springer-Verlag, 2003), v.

[72] See Kittler, "Forgetting," 93–94.

[73] von Foerster, "Preface," v.

In 1971, an epistolary exchange between technologists in Chile and England activated a plan to design a system that would apply the principles of management cybernetics to the Chilean economy.[74] This country had just undergone unprecedented socialist political reforms that included the nationalization of several companies. This process required the implementation of truly sophisticated management techniques if the government was to effectively keep pace with the increasing complexity of the state-run economy. Thus, this correspondence began with the technological director of the Chilean Development Agency, Fernando Flores, who asked the management cybernetics expert Stafford Beer to guide the implementation of his own work in the Chilean context. The exchange continued with the British cybernetician typing his response to Flores's call, which was not only positive, but enthusiastic.[75] Thus, the project later known as Cybersyn was configured as an enterprise consisting of four parts: 1) a network of teletypewriters called Cybernet, which would place an input/output node in each nationalized company participating in the system; 2) a central processing node called Cyberstride, which would statistically analyze the data sent by the companies; 3) a simulation suite called CHECO, which would model possible scenarios for the local economy, based on relations between the processed information and international economic flows; and 4) an operations room called the Opsroom, where seven senior government officials and experts would discuss and make data-driven decisions, which would then be fed back to the nodes in the companies, always through the system's infrastructure.[76] And while important scholarship has been written about the socio-technical and political aspects that surrounded the case and would have defined its scope,[77] this article argues that not enough has yet been said about the actual cybernetic human-machine coupling that Cybersyn could have set in motion.

Hence the importance of *forgetting* as a (first) conceptual apparatus linking cybernetics and German media theory. And for the same reason, there is the importance of Project Cybersyn as perhaps one of the few applied cases of cybernetics that could help us to witness whether such a theoretical apparatus transcends its *symbolic* status and proves to be as *real* as it is *imaginary*$_{78}$—that is, truly technological.

In each input/output node of the Cybernet, a human being would type a series of information according to the protocols implemented by the system, by the project. Thus, through the persistent severity of the Q-W-E-R-T-Y keyboards, through the implacable grids drawn by the punched paper tapes of the teletypewriter, this procedure would silently eradicate any space for semantics and interpretation. The bodies of the typists would then become, perforation by perforation,

[74] See Diego Gómez-Venegas, "Cybersyn y la memoria simbólica del papel," *Artnodes*, no. 23 (January 2019).

[75] See Alberto Mayol, "Cuando la utopía es el fórceps para alumbrar una nueva era," in *The Counterculture Room*, ed. FabLab Santiago (Barcelona: Polígrafa, 2017), 24–25.

[76] See Eden Medina, *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile* (Cambridge: The MIT Press, 2011), 96.

[77] See Claus Pias, "Unruhe und Steuerung. Zum utopischen Potential der Kybernetik," in *Die Unruhe der Kultur. Potentiale des Utopischen*, ed. Jörn Rosen and Michael Fehr (Weilerswist-Metternich: Velbrück Wissenschaft, 2004); "Der Auftrag. Kybernetik und Revolution in Chile," in *Politiken der Medien*, ed. Daniel Gethmann and Markus Stauff (Zurich-Berlin: Diaphanes, 2005); Sebastian Vehlken, "Environment for Decision – Die Medialität einer kybernetischen Staatsregierung. Eine medienwissenschaftliche Untersuchung des Projekts Cybersyn in Chile 1971-73" (master's thesis, Ruhr-Universität Bochum, 2004); Eden Medina, "Designing Freedom, Regulating a Nation: Socialist Cybernetics in Allende's Chile," *Journal of Latin American Studies* 38, no. 3 (2006): 571–606; *Cybernetic Revolutionaries.*

a surface of inscription—an always erasable surface of inscription. Attached to the machine by a procedure that divided every meaning into individual symbols, and thus, into a code of presence and absence that could only be read by other machines, "humans change their position."[79] This is why random access memory seems to have been a key and distributed cybernetic component of Project Cybersyn.[80] But again, this is still a conjecture. More research is needed to determine the exact nature of the protocols mentioned above, and thus, the exact structure of the series of information that the typists typed into their teletypewriters. In the same way, a media archaeological work on such a device is also necessary. This is so, because we must be able to structurally define the input/output operations of the teletypewriter with precision if we want to technologically understand the data-driven human-machine coupling that this device could have activated. However, what we already know—e.g., that Cybersyn's telex network proved to be reliable and strong,[81] that a specific protocol was designed for each industrial sector and company, and that every day a typist sat in front of a teletypewriter device to serially enter the company's daily operations[82]—allows this article to outline a preliminary hypothesis, suggesting that such a network would have constituted an always erasable, an always rewritable, network of information and telecommunications where device and human being were part of a single but interconnected random access node, where the technological operation of *forgetting* was sovereign.[83]

Similarly, the central processing node, an IBM 360/50 mainframe computer connected to a teletype machine that served as an input peripheral, received the data coming from the Cybernet nodes in the form of punched paper tapes.[84] There, a software suite programmed in Assembler and PL360—plus some routines written in Cobol and Fortran where punched paper cards were also fundamental—allowed the daily statistical analysis of the data.[85] In other words, the permanent procedures of the system, its ROM, either written in the machine itself or stored on perforated pieces of paper that the machine could handle and decode, would ensure that *forgetting* would not be forgotten.

If "it is only on paper that the 'human being' originates," it may be that, as a reborn or renewed species, "humans change their position" through it as well. Thus, it seems that German media theory and cybernetics—as an essential composite—can help us understand how and why media cultures have moved from storing to remembering to erasing to *forgetting*; and, perhaps more importantly, how this technological process came to determine our relationship to the past, the present, and the future—our condition as historical or, rather,

[78] This refers to Jacques Lacan's registers of the real, the symbolic, and the imaginary which Friedrich Kittler translated into media theory in order to explain how the technological functions of transmission, processing, and storage define our situation. See Kittler "The World of the Symbolic – A World of The Machine," 135. [Note added in the 2024 update for clarification].

[79] Kittler, *Gramophone, Film, Typewriter*, 210.

[80] In an earlier paper, I argued that the typists behind Cybernet's teletypewriters had to be considered read-only memory modules, or ROMs. I was wrong. This was a misinterpretation of Kittler's article "The World of the Symbolic – A World of the Machine," which, ironically, I formulated before including "Forgetting" in my research. According to Kittler, every typist, or more radically, every human being, must be considered here as a RAMs. See Gómez-Venegas, "Cybersyn y la memoria simbólica del papel"; and Kittler, "Forgetting."

[81] See Medina, *Cybernetic Revolutionaries*, 149.

[82] Isaquino Benadof (former Cyberstride chief programmer), email message to the author, August 21, 2018.

[83] A friendly reminder to the reader that the original version of this article was published in early-2020—but actually written in late 2018—and that all of the research necessary to turn this informed conjecture into an archivally documented investigation has already been done—a process that, in turn, has refined and even corrected some of the statements in this and the next paragraph. Until the dissertation containing this final research is published, see Diego Gómez-Venegas, "Encoding from/to the Real: On Cybersyn's Symbolic Politics of Transmission," in *Frictions: Inquiries into Cybernetic Thinking and Its Attempts towards Mate[real]ization* , ed. Diego Gómez-Venegas (Lüneburg: meson press, 2023), 91–117. [Note added in the 2024 update for clarification].

[84] Benadof, email message to the author.

[85] Benadof, email message to the author.

more-than-historical beings. A case like Cybersyn provides the facts; Kittler's and von Foerster's theories of *forgetting* provides the methods.

In summary, this article has first attempted to genealogically trace the emergence and relevance of the notion of *forgetting* in both German media theory and in cybernetics. To this end, connections were drawn between the early works of Friedrich Kittler and Heinz von Foerster. This was done in the wake of Jan Müggenburg's article "Bats in the Belfry," in which he points out that von Foerster's thinking could have reached Kittler indirectly through Siegfried J. Schmidt, for example.[86] Alternatively, however, this text has re-read and examined Kittler's "Forgetting" and von Foerster's *Quantum Mechanical Theory of Memory* to suggest a more direct influence, the ramifications of which can also be seen in Kittler's *Discourse Networks*, as well as in *Gramophone, Film, Typewriter*, and *The World of the Symbolic – A World of the Machine*. Second, this article has also studied Moritz Hiller's *Unter Aufschreibesystemen* in order to insist with him that just as Shannon's *Mathematical Theory of Communication* is not a founding element of German media theory, the *problem of memory*, and more precisely the question of *forgetting*, signals such a founding root. Accordingly, the fact that this question—as a thin, sometimes hard to see, but nevertheless strong, matted thread—crosses German media theory and cybernetics weaving a web of relations, can ultimately be seen as a unique fabric that constitutes the common core of both fields. Finally, this article has attempted to outline a preliminary re-examination of Project Cybersyn through the question of *forgetting*, in order to not only point out the centrality that this transversal fabric would play in the analysis of media cultures and their antecedents, but also to suggest that such a project could prove critical in assessing the scope of the notion of *forgetting*, and, similarly, the performance of German media theories and cybernetics when it comes to the analysis of modern knowledge and its technologies.

[86] Müggenburg, "Bats in the Belfry," 476–77.

As a result, some questions are only sketched here, not in search of immediate answers, but in an attempt to delineate future areas of investigation. For example, only two of Cybersyn's subprojects—Cybernet and Cyberstride—have been preliminarily discussed in these pages, deliberately avoiding the spectacular Opsroom, the part of the project that has received, unfairly, all the attention in the past. And while I have stated in previous articles that the Opsroom must be forgotten in order to grasp the true cybernetic scope of Project Cybersyn,[87] a more nuanced approach will make it possible to understand that only by focusing our attention and archaeological gaze on efforts like Cybernet and Cyberstride will we be able to fully comprehend the role that spaces and devices such as the Opsroom would

[87] See Gómez-Venegas, "Cybersyn y la memoria simbólica del papel."

have played in the configuration of technologies of *forgetting*, as well as in the transitional state of *the archive*, and even more so in the permanent but somehow always forgotten presence of cybernetics in our cultures.

"Black out."[88] In times of cybernetics, when presence equals present in a constant feedback loop, "memory is literally permanently in transition."[89]

[88] Kittler, "Forgetting," 116.

[89] Ernst, "Archives in Transition," 97.

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