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# On collegiality: Kittler models Derrida

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## Abstract

Kittler was among the first to invite Derrida to lectures in Germany, and to translate Derrida's texts into German. Yet a cursory tally in his references does not always do justice to what Kittler's media theory owes to deconstruction. *Discourse Networks* credits Derrida with a mere 'rediscovery' of grammatology, although Wellbery's foreword labors mightily to identify the deconstructive traits in Kittler's work. *Gramophone, Film, Typewriter* reduces *The Post Card*'s complex networks to an allegation that 'voice remains the other of typescripts' – as if Kittler had not in fact taken a much more subtle evaluation of hearing oneself speak from Derrida. What happens to the writability and citability of texts if they are sorted into such neat binary distinctions of logical or poetic orientation? What, to Kittler, is the quotability and readability of the body of work titled Derrida?

## Keywords

Jacques Derrida, didactics, Friedrich Kittler, model, theory

A proposition, a picture, or a model is, in the negative sense, like a solid body that restricts the freedom of movement of others, and in the positive sense, like a space bounded by solid substance in which there is room for a body. (Wittgenstein, *Tractatus Logico-Philosophicus* (1921): 4.463)

What could one learn from Kittler? What would he teach? Just what is it, if anything, that makes his work so different, so appealing? These questions are doubly complicated by the fact that Kittler professes, on the one hand, that 'it is and has been my belief that my work is not concerned with interpretation because it is not me who is

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speaking or writing but the texts themselves'. On the other hand, in the same interview, he also confesses that

my work in literary criticism was not only a pretext but also a historical necessity which, all the same, permitted me to talk about German poets whilst saying things I wanted to state in my own name but did not dare to articulate. You may ask why it was so difficult to say things in my own name. Well, apart from the fact that I am a shy person, it was very hard during that time in Germany to move beyond the study of dialectics and the self's relation to itself. (Armitage 2006: 18)

This redoubled *captatio benevolentiae* notwithstanding, neither being shy nor feeling hemmed in by intellectual convention seems to have prevented Kittler's academic success.<sup>1</sup> There is no doubt that within German academia, beyond the boundaries of disciplines (be they capitalized and institutionalized as Literature, German Studies, Media Theory, Aesthetics, or Cultural History), Kittler's work has been, as they say, 'schulbildend': which is to say, (re)formative in that there is now an extending ripple of scholarship associated with what Friedrich Adolf Kittler first modeled.<sup>2</sup> This obtains not only for German-speaking academia and its exports, but increasingly also for other academic spheres where media studies and the history of cultural technology are focal points in higher education and research (see Winthrop-Young 2010, especially his concluding comments or 'final checklist').

By the same token, it remains true that while key publications by Kittler have been translated, much more remains accessible only to those proficient in German; and it remains to be demonstrated what the institutional success of discourse analysis and media theory in a German mold or mode, in turn, owes to import – including translations of Derridean thought, in a complex cross-border fellowship (compare Peters 2008 and Geoffrey Winthrop-Young 2006), to a degree perhaps unremarked in the Anglo-American reception of poststructuralist and other contemporary thought bottled and sold as 'French Theory'. In order to get a concise overview of what those lessons were, there are worse starting places than Kittler's little known but useful essay on didactics and international influences in the humanities – namely his contribution to a yearbook of German didactics under the title 'Derrida's Didaktik' (Kittler 1989). Characteristically, it is a Kittler text that purports to let someone else's writing address the issue, in order to express what Kittler himself might claim to have been too shy and too professionally constrained to say directly.

Dating to the supposed end of the Cold War in the year 1989, this piece observes one of the maxims of Kittlerian media history – that war is the father of invention – but in this specific case, the focus is on veterans of the Culture Wars. Kittler opens and closes with quotations from Derrida referring to the North American debates over whether or not the theoretical humanities, and particularly literary Theory with a capital T, are to blame for what cultural conservatives like William Bennett deplored and attacked as the decline of the humanities or even of humanity as a whole: since teaching that there are no texts means that there are no great texts, which means there are no reasons to read.<sup>3</sup>

Yet Kittler hastens to add right away that what is under attack in the humanities is surely not text or reading, but the institution that stores, processes, and transmits in these

and other ways: the university itself – and so Kittler delivers ‘the good news that poststructuralists not only read, but also teach’. Note that Kittler in ‘Derrida’s Didaktik’ does not distinguish, explicitly or implicitly, between deconstruction and discourse analysis as textual theories. Thus one might claim that part of the appeal that made Kittler’s professing, in that deliciously untranslatable word, ‘schulbildend’, is indeed that he draws on implicit and explicit translations of French post-structuralist theory as much as he does on German and Anglo-American references: Lacan and Virilio, Turing and Shannon, Heidegger and Nietzsche, to name but a few – though, in an interview, Kittler said: ‘for me, the import of Foucault and Lacan rests on the fact that their writings are two possible ways of returning to Heidegger without naming him’, and surely the same goes for Kittler’s Derrida, who in turn was engaged in readerly-writerly exchanges with Foucault and Lacan as well (Armitage 2006: 20).

In an important and pivotal sense, Kittler’s work authorizes and gives rise to scholarship in the theoretical and historical humanities that neither bridges nor overcomes, but rather fills the gap in what a prior generation had diagnosed as two cultures in academia (Snow 1956; Gould 2004). A cursory summary of Kittler’s take on ‘Derrida’s Didaktik’ turns up standard recommendations Kittler had been making for a long time: attentive reading is a necessary virtue, even and especially in times when journalism and politics pay no heed to the traditions of accurate and faithful citation; university employees must reflect critically on universities and their role, even and especially in the realization that the professorial profession is an impossible one, as he quotes Freud; an epoch of the post is coming to an end as more and more data present themselves on silicon chips – which means, as Kittler writes with reference to Nietzsche, Foucault, and Derrida, that knowledge transfer is a radical challenge of our times. Finally, alluding to Derrida’s hope of construing a program that can compete with the supercomputer that is a James Joyce novel, Kittler argues that the two elementary cultural techniques of reading and writing must be extended by a third one, namely programming: the didactic imperative of media studies is to go beyond using ‘Microsoft Word 5.0’, as Kittler mockingly writes, and to teach ‘how texts are truly programmed’.

In sum, Kittler’s entry in the *Jahrbuch der Deutschdidaktik* is a succinct survey of his own recursive, self-reflective expectation that institutions be read, that their textual productions be collapsed back into the rules governing their authority – that authorship be relegated, in a literal sense of binding it back to what gives rise to it. In explicating his take on ‘Derrida’s Didaktik’, Kittler unfolds again his take on a reading procedure that rejects conventions of hermeneutic and political interpretation in favor of an implosion – finding in the governing or programming structures of institutions the rules that write the texts that issue from those institutions, as Kittler does in his reading of Schiller’s *Don Carlos* (and more generally of Schiller’s early dramatic work) on the basis of the program drafted in 1770 for a school where Schiller enrolled as a young student, the Karlsschule. This of course means that instead of reading *Don Carlos* as protest against the Count, it is in fact, Kittler argues, merely Schiller copying from the rules the Count had set up for his school.<sup>4</sup> But the lesson is somehow expected to scale – from Schiller’s schooling to higher education at the end of the 20th century, from before the typewriter and the gramophone to after fiber-optic computer networks.

Simply put, media studies is the introduction of the question of technology into the humanities, proposing to shift the focus to ‘networks of technologies and institutions that allow a given culture to select, store, and process relevant data’, as Kittler put it (Kittler 1990: 369). Scholars of human culture became increasingly ‘influenced by the twentieth-century fluidity of media, in which a story might begin as a magazine serial, then become a book, and then a film’, as Northrop Frye put it, and the necessity to supplement established models with new ones became evident (Frye 1991: 6). It was Vilem Flusser who argued, in an essay titled ‘On the Crisis of our Models’, that some models of scholarship were neither furnishing historical fidelity nor allowing for contemporary media technologies that were revolutionizing every field of knowledge generation and distribution (Flusser 2002). Starting from ‘the suspicion that some new media of communication might offer possibilities for the elaboration of new types of models’, Flusser and others of his generation pioneered what has come to be called ‘media studies’ as they encountered television and video art, computation and networks. To Flusser’s ‘theoretical thinkers and those who experiment with the new media’, there was a manifest need for an intervention in the interstice between exclusionary academic practices, specifically in supplementing spatial models (writing, graphs, illustrations) with time-based modeling (films, videotapes, etc.).

So what moves an entire generation of academics trained in philosophy and literature, like Flusser and Kittler, to postulate new models is the surmise that new cultural technologies not only had to be accounted for but also and by the same token came to their aid, between and beyond techno-scientific and interpretive modes that were the legacy of academic divisions of labor since the Enlightenment roots of the research university. Where, traditionally, language and image were understood as separate realms of signification, new media no longer juxtaposed their symbolic and technical modalities but combined them. Where one had classified speculative endeavors as either fiction or science, out of science fiction arose not just a new entertainment genre but also a range of new industries catering to the gadget lover in a media society. And the differences between thinkable and sensible, between imagination and perception, are drawn differently where new media give rise to new forms of exploring and expressing things that had previously seemed unimaginable or unthinkable.

The use of models of course has a long tradition in education, from long before Francis Bacon’s ‘New Atlantis’ provided a ‘model for a college’ to long after Descartes invited his readers to follow his model of thinking. The term is often taken literally, as when artists including Leonardo, Michelangelo, and Dürer, or Galilei, but also the philosopher Leibniz, drew and built models of defensive fortifications. Closer to our time, it was famously the Tech Model Railroad Club (a train set maintained in the 1950s and ’60s with an elaborate communication system) that gave rise to the MIT hacker scene; or consider the long tradition of the model airplane – from before the Link Simulator to after the current generation of Microsoft Flight Simulator games (Levy 1984: 50–2; Johns 2010: 473).<sup>5</sup> And indeed, it is the airplane that bundles and focuses the kind of media analysis that Kittler models: for while ‘in the jumbo jet, media are more densely connected than in most places’, they remain divided into two areas of competence: computers, radar, diode displays, radio beacons, nonpublic channels are at the disposal of a necessarily interactive crew, while passengers are restricted to audio tape,

film, and airline cuisine — one-way consumption, with the notable exception of the in-flight telephone.

Yet this remark by Friedrich Kittler can be found only in the first translation of his preface to *Gramophone, Film, Typewriter* as it appeared in a journal in 1987; inexplicably, however, this paragraph is missing from the published translation of the entire book.<sup>6</sup> To different degrees, then, one may opt to be partially disconnected from the experience of flight by canned media, or one may attempt to brave the tasks of navigation and service with multiple connections. This amassing of all media in one place can deliver any message — even, as the coordinated suicide attacks by Al Qaeda against the United States on 11 September 2001 revealed, the final message that is the bomb. Yet to passengers and crew, and by extension to all of us living in media society, the direction our sensurround takes us is not always evident. Beyond flight and radar, we arrive at information theory and computing: and indeed Kittler's greatest respect is reserved for ideas so explosive that they cannot be tested except in simulators, *in silico* — like the mathematics of Hilbert, Turing, and von Neumann (Kittler 2002). In short, for Kittler, learning from the arts and sciences implies a model didactics.

Counting, measuring, and weighing give rise to the construction of instruments and machines; in turn, such machines can calculate, advancing the use of formulaic expression of theorems and axioms, rules and laws. This leads to the point where complex models can serve to illustrate, depict, visualize, and test speculative or hypothetical constructs and ideas. Invoking these processes is of course not in the least to suggest that the humanities emulate the sciences, become quantitative sciences, or use computing to lend a scientific veneer to what they continue to pursue. On the contrary: what the study of cultural technologies in general and media studies in particular powerfully suggests is that it would radically impoverish our intellectual landscape to leave to the techno-sciences the salient interpretive and heuristic tasks that are the expertise of the humanities. The point is, rather, that Kittler and others of his generation abandon hermeneutics and philology in favor of what one may call 'modeling'. Indeed, the use of models is familiar to students of semiotics, epistemology, and cognitive science, and found entry into systems theory, cybernetics, and information theory as well (Stachowiak 1983; Mahr 2003). Just as we rely on our cognitive models of people to interact with them, we rely on scaling up our models for collective social situations. Certainly the world of finance has relied rather heavily on models, based on basic assumptions that are tested by longitudinal data. Hence rational expectationalists believe the economy naturally reverts to equilibrium, and seek 'beta' in the wisdom of crowds, while reflexive behavioralists believe that the world persists in a state of fluctuating disequilibrium, and seek 'alpha' opportunities in the madness of crowds. Media studies is likewise sundered between those who see crowd-sourcing as the major force of transformation and progress, from the print and screen mass media of the 20th century to the diversified mediascapes of the 21st century, and those who warn that the dispersion of attention and the sheer noise of ever larger numbers of participants in media drown out what is most valuable, whether it be in news or in entertainment.

This is not the place to try and arbitrate between these irreconcilable positions. The standard financial disclaimer that past performance is no guarantee of future results surely is an apt analogy for media history as well. Nonetheless, media studies may expect

to extract some benefit, though not as formulaic as an alpha or beta deviation, from not only recording history but also extrapolating trends. One major trend of the past five decades is undeniably a confluence of massive computation at speed with numerous variables, giving rise to pattern detection as it moves from data to image to data, and input and control devices that have greatly expanded the way we store, process, and distribute information as networked computers become the 21st century's 'epistemology engine', inheriting the role of the camera obscura for philosophers like Descartes or Locke (Ihde 2006: 79). For readers of Kittler's lectures on *Optical Media* that just recently appeared in English, it is a regrettable taunt that his genealogy there should stop short of the computer age; but it is of course true that Kittler elsewhere devotes much attention to the irreducible difference computation makes in human culture and aesthetic communication (Kittler 1997, 2010).

If computers can identify and register components of a particular object class at various levels of detail, then models play a seminal role in programming them to recognize an image as input so as to produce a symbolic interpretation that can adequately describe what objects are present, including information about spatial relations between objects.

Each model is defined in terms of a subset of points on a reference grid, *the template*, a set of admissible instantiations of these points, also referred to as *deformations* of the template, and a statistical model for the data – given a particular instantiation of the object is present in the image. (Amit 2002: xii)

Logicians might object that a model ought not be defined by having the 'model' act as one of its own three components, but the tripartite structure of template, instantiation, and Bayesian distribution yields computer-recognizable objects, which is of importance in such fields as facial recognition software, medical imaging (e.g. ultrasound or MRI), satellite image evaluation, and so forth – for both detection and recognition. The double use of the term 'model' demonstrates how dependent this algorithmic approach is on two pre-existing conceptions: namely, both of what defines the overall approach to image recognition and of what defines the statistical attributes that are useful to that approach.

Such terminological difficulties notwithstanding, the term 'model' is therefore used advisedly here, as a concept that helps bridge subject and object, consciousness and behavior, theory and empirical data, imagination and experiment. One can distinguish between a model of something, and a model for something, in saying provisionally that the former helps us render a question or problem so as to make it tractable and accessible, whereas the latter implies an exemplary, guiding, or normative role (Geertz 1973: 93). Yet both kinds of models are exercises of the imagination. The impressive *Fram* museum in Oslo, for instance, shows several models of ship hulls that were developed and tested before building the full-scale ship, which famously went on to endure repeated trips to both polar regions of our planet – adventures that surely do not only belong to the history of science, but have also continuously fired the human imagination so as to engender numerous novels, films, art works, and other cultural expressions, drawing on utopian fiction as well as on military history that makes extreme exploration and later extreme tourism possible, and most recently drawing also on an awakening global ecological concern.<sup>7</sup>

The term ‘model’ is also used in the context of software design. Here too, a model is more than a hypothetical description of a complex entity or process. Just as the arrival of the personal computer changed the common perception of what software could and would do once it was no longer the exclusive preserve of large-scale research laboratories, the arrival of the internet and its most popular cultural layer, the worldwide web, again changed the perception of what roles software could and would play. Furthermore, as portable computers and mobile phones, cars and toys have computing and networking capabilities, the ‘software agent’ became a prevalent metaphor, blurring the boundary between people and technology.

While in general parlance, an agent is a person carrying out a task on behalf of someone else (travel agent, talent agent, real estate agent), in computer science an agent is a software entity that can react to changes in its environment: whether it is the Roomba robot vacuum cleaner, the Tamagotchi simulation toy, the AIBO electronic pet, a computer virus, a smart home system for automation (and remote control) of lights, sound, irrigation, alarm, air conditioning, or a web crawler serving a search engine. On a larger scale, multi-agent simulation systems like the Smart Whole Air Mission Model (SWARMM) can integrate a physical simulation of aircraft with pilot tactics and strategic reasoning (Sterling and Taveter 2009). In this context of applying lessons learned in modeling to integrated systems, the promise is that if you can model, you have progressed a significant part of the way towards building something complex, assuming your observations and implementations of relations or mechanisms are transferable. Indeed, the main developer for successful computer games such as *Left4Dead* learned his craft on a flight simulator – but the question remains: how does one get from building a model of the solar system in secondary school to building a model of a complex open world where humans can interact with one another and with artificial intelligence instances such as non-player characters?

A model needs to be complex enough to reflect the issues it needs to address, but no more complex; it thus tends to be an approximation, rather than a scaled copy, of what it seeks to aid with – thus, in this sense, to model means to abstract. Before scaling up to complex scenarios where agents automate some or all of the activities, the software designer needs to pare down interactions, responses, or an expected range of expressions so they can fit into a programmable repertory. Moreover, taking cell biology as the study of complex adaptive reproducing systems gives rise to computational modeling, and so on – there is scarcely an academic discipline that does not make productive use of models, be they depictions or prescriptions, constructions or speculations, abstractions or illustrations (Szallasi et al. 2006).

Needless to say, in the humanities the emphasis will necessarily remain on theoretical rather than physical modeling, even in the face of collating and analyzing large data sets. Theoretical modeling here is not to confuse or conflate ‘model’ with ‘theory’ but merely to denote a heuristic and explorative function. A model can fulfill expectations and thus confirm theoretical hypotheses, or it can violate them and thus question the basis for its modeling – ‘as a tool of research, then, modeling succeeds intellectually when it results in failure’ (McCarty 2004). Some commentators propose to clear things up by stating that modeling may be useful, appropriate, stimulating, but by definition never strictly true; its pragmatic pay-off is in isomorphic abstractions that allow us to test for variations

and variables in scenarios and case studies (Shanin 1972). As Flusser put it, ‘models are tools for the understanding of phenomena’ (Flusser 2002: 75). Any such model is by definition a simplified and thus idealized representation.

Now, it is important to remember that as Kittler turned away from the history of literature and towards a larger frame of cultural reference – not just media technologies but mathematics, codes, archives, music, and other cultural technologies – he sought to draw a distinction between fiction and simulation, coming down rather forcefully on simulation’s side (Kittler 1988; see Engell 1994; Winsberg 1999). Thus it might not surprise his readers when Kittler, in his essay on didactics, makes a simulated Derrida speak. Were he to invite Derrida to deliver the address in Kittler’s stead, he speculates, Derrida might well begin by announcing that he was not there to teach anything, except that teaching something is impossible. This statistical extrapolation, Kittler continues, further suggests that Derrida would follow up with commentary on that initial speech act, including the clear distinction between the titular claim of a professor to profess the models of a profession, simultaneously undermined by the proposition that such didactics is impossible. Kittler concludes that this simulated guest lecture would therefore need to enter into a ‘spectral dialogue’ with texts, with precursors and models – which is to say that such a fictive but plausible Derridean didactic lecture would necessarily be programmed by the academic program, by the institutional logic that binds pedagogy and didactics of higher education to the explicit consideration of institutional conditions of possibility, which is to say, in this case, those of the university.

The opening of this simulated Derrida lecture with its doctrine that teaching is impossible would be distinct from the *docta ignorantia* of Nicholas of Cusa and from Faustian knowledge ‘that we cannot know’ – it would indeed contain information and thus a didactic function: for the listeners would learn about texts and facts from European and American history insofar as it is a matter of analyzing or deconstructing their fundamental concepts. Instead of leaving master thinkers well alone to archival slumber, their arguments and terms would return into memory. Thus deconstruction fulfills the elementary determination of pedagogy to fight against oblivion that never rests in the oscillations of presence and absence, or of generations, at least as long as there are data outside of databases. (Kittler 1989: 34)

Kittler’s Derrida-model, in short, is not simply mnemotechnics as pedagogy, but an ironic re-staging of themes and arguments from the history of thought, rather than simply citing them or alluding to them. To legitimate his speculative model of a Derridean didactics, Kittler quotes actual lectures delivered by the non-simulated Derrida: at Freiburg, a discussion (translated by Kittler) of the academic practice to demand a lecture title that inscribes the promise to deliver a speech in state institutions; at Strasbourg, a lecture on the concept of gender in philosophy and literature, including reflections on co-education and the possibility of reading conference talks as love letters; and at Cornell, the explicit interpretation of the American research university as part and packet-switch of what Eisenhower called the ‘military-industrial complex’ that binds multinational corporations and information technologies into a concept of rationality that is overtly strategic, contrary to other concepts of rationality that a university might allow for.

On the one hand, Kittler was among the first to invite Derrida to lectures in Germany, and to translate Derrida's texts into German. On the other hand, a cursory tally in his references does not always do justice to what Kittler's writing owes to deconstruction. *Discourse Networks* credits Derrida with a mere 'rediscovery' of grammatology, although Wellbery's foreword labors mightily to identify the deconstructive traits in Kittler's work (Kittler 1990). *Gramophone, Film, Typewriter* reduces *The Post Card's* complex networks to an allegation that 'voice remains the other of typescripts' – as if Kittler had not in fact taken a much more subtle evaluation of hearing oneself speak from Derrida (Kittler 1999). What happens to the writability and citability of texts if they are sorted into such neat binary distinctions of logical or poetic orientation? What, to Kittler, is the citability and readability of the body of work titled Derrida?

When Kittler talks of Derrida's didactics, he collapses the logic of academic institutions into the texts they read, write, and circulate. This storage, processing, and transmission of deconstructive writing within Kittler's work is therefore perhaps most interesting where it touches upon the university itself, and upon the didactics of discourse analysis and media history after post-structuralism. Much might remain to be said about citation politics, about translation politics, about the strategies of publishing and marketing academic books in France and Germany and the USA and elsewhere; and certainly Kittler has acknowledged a debt of gratitude to Derrida with regard to those institutional parameters. But this is perhaps not the place to lapse back into an ideology of faithful friendship and philological virtue in the teeth of such institutional pressures. The point here is simple: instead of theories writ large, one can productively continue the work Derrida and Kittler and others have begun, by taking their interventions not as bridge-heads and tactical advances in a real or imaginary war of academic forces, but rather by taking them as models – scaled down, modest, functional, pragmatic, dynamic ways to develop and test hypotheses. The point surely is not which approach is most 'true' to theory but which will yield a solution set that resolves the features of the system we seek to understand – whether it be in terms of philosophy, literary history, or media technology.

Thus the lasting legacy of Kittler's reductive yet didactic 'Derrida model' is not only that it productively side-steps mutual rear-guard actions in the academic trench skirmishes of the culture wars, but that it opens up to a research design that enables a rigorously historical and conceptual study of cultural technologies. If Kittler has found his most productive reception in film and media studies, it is because the photographic, cinematographic, televisual, and computational media defining our lives demand better intellectual models instead of new theories (McCarty 2003). Beyond structuralist and semiotic accounts, beyond even the most expansive textual theories to which Kittler's essay quietly relegates Derrida, what Kittler offers to teach would account for the epistemic power of images, the programmatic inscription of mathematical formalism, and go beyond binaries of orality and literacy to fully account for production, storage, and transmission of rich data. Kittler would have you study texts that are technologies, as in executable code; he would have you pay attention to the fungible materiality of the symbolic and to the operative affordances of institutional programs. In short, despite the fact that Kittler's academic output has been translated and received in terms of

poststructuralist theory, there is a model here – a functioning model with stable properties that can be tested with multiple variables, regardless of the specific validity claims of theoretical discourse as found in Heidegger and Nietzsche, Shannon and Turing, Lacan and Derrida.

## Notes

1. In a more recent text, Kittler even suggests that everyone before ‘All you need is love’ begins with a *captatio benevolentiae* – and does so himself, again (Kittler 2009: 137).
2. An overview of the German media studies scene since 1970 is offered by Geisler (1999), and a decent introduction to Kittler’s work available in English is Partington (2006). See also the recent debate in the pages of the *Zeitschrift für Kulturwissenschaften* 2 (2008), 113–152 and of *Grey Room* 29 (Fall 2007).
3. The lecture by Derrida which Kittler cites was first published in English as ‘The Principle of Reason: The University in the Eyes of Its Pupils’ (1983).
4. Friedrich Kittler and Stefan Banz (1996: 10–12), with reference to Friedrich Kittler (1984).
5. On the Link simulator and its progeny, see <http://www.link.com/>, <http://www.microsoft.com/games/flightsimulatorx/>, and <http://www.rc-airsim.com/Gilbreth>.
6. The complete translation of Kittler’s piece appeared in *October* 41 (1987: 101–118) and was reprinted in Kittler (1997: 28–49, quotation from 32).
7. On this trajectory, see Peter Krapp (2011, forthcoming).

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