

- 2) the dreamworlds surrounding media and technology, and the way they get invested with weird desires and social constructions (Beloff's media-archaeological art being one of the best examples of this).

In addition, as I want to argue:

- 3) imaginary media as shorthand for what can be addressed as the non-human side of technical media; the fact that technical media are media of non-solid, non-phenomenological worlds (electromagnetic fields, high-level mathematics, speeds beyond human comprehension), and because of that ephemeral nature they are often described in the language of the fabulous, the spectacular.

Hence, imaginary media are tightly interlinked with non-human technical media, especially since the early nineteenth century, and this materialist notion of imaginary media also differs from Zielinski's more poetic vision. This chapter tried to point towards how imaginary media research can extend in new directions, to think the 'imaginary' as less Lacanian (providing dreamworlds of unified imaginary bodies) but as an affordance for the new – to think media anew, and in weird places, in weird bodies.

### Further readings

- Kluitenberg, Eric, ed. (2006) *Book of Imaginary Media. Excavating the Dream of the Ultimate Communication Medium* (Amsterdam and Rotterdam: Debalie and NAI Publishers).
- Peters, John Durham (1999) *Speaking Into the Air. A History of the Idea of Communication* (Chicago and London: University of Chicago Press).
- Sconce, Jeffrey (2000) *Haunted Media. Electronic Presence from Telegraphy to Television* (Durham and London: Duke University Press)
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## 4

### Media Theory and New Materialism

We finished the previous chapter with a call for a more material way of understanding imaginary media: how the various phantasmatic expressions such as ghosts and other supernaturals are actually super-phenomenological – supersensual, as Henry Adams described them; they expand outside the normal human ways of sensation. This has been an important theme in media studies in general: in addition to mapping the social, political and historical contexts of emergence of new forms of human communication, whether we are looking at remediations of blogs in relation to earlier modes of writing technologies, techniques of communication over distance from the telegraph to the Facebook era, or the visions of human communities from the suburban television families of the 1950s to the online cultures of peer-to-peer, there are important non-human elements which are integral to what constitutes the modern scientific world. This chapter continues the theme of materiality by explicating, through German media theory (a slightly unsuccessful term that suggests too much national spirit), also often called materialist media theory, or even hardware theory, how media-archaeological research has elaborated the material ontologies of and challenges to the storage, distribution and processing of communication events. In this chapter, I will look more carefully at such writers as Friedrich Kittler, Bernhard Siegert, Claus Pias and Wolfgang Ernst, among others. But German media theory is, of course, not the only one to address materiality, and nearer the end we will connect some of the threads to recent developments in Anglo-American media studies. As such, the key themes that stand out from this chapter are things and materiality, as well as medium-specificity.

**Hard(ware) theory**

Media archaeology has been always fascinated with objects, apparatuses, and remnants of past media cultures – monuments from past media ages. Even to an excessive amount, it has shown a curiosity-cabinet kind of awe of quirky devices and pre-cinematic toys as the alternatives to a mainstream media history. Marshall McLuhan was one of the early media theorists interested in expanding the notion of ‘media’ in a variety of ways in which different spatial and temporal constellations, from architecture to clocks, could be seen and conceived as ‘media’. One of the reasons for this was that he was very much embedded in a similar situation to the one we are in now, concerning a media cultural change: having to rethink many of the institutional but also aesthetic contexts of seemingly familiar media technologies such as cinema (expanded cinema discussions in the 1970s), as well as books and writing (one of McLuhan’s favourite topics, due to his background as a literature scholar) which meant moving away from the Gutenberg-era book-object to much more decentralized, distributed and mobile forms – what we now talk about as ‘e-books’. Hence, the material basis of media technologies – and books are only one example – is changing, for which historical perspectives might give not only comforting back-up (‘nothing is as permanent as change’) but also ideas to push the change forward: how to rethink familiar media technologies in new material constellations and in ways that lead to new modes of using, consuming and institutionalizing media.

The emphasis in media archaeology has been on nineteenth-century devices that seemed to gesture not only a way towards the birth of cinema, but also to the possibilities for differing routes. As outlined in chapter 2, such devices signalled relations more tactile, more personal and otherwise different with regard to the body than occurred with the later birth of the mass-audience full-length fiction film. In other words, ‘hardware matters’ (Christie 2007), and investigations into the material hardware characteristics of media technologies matter as much – in terms of how they can demonstrate the different ways in which toys, instruments and tools were incorporated into practices of use and the visual culture of the nineteenth century. Emphasizing hardware matters in the midst of the increasing invisibility of consumer objects in digital culture is an important political task for media-archaeological research; this invisibility was already part of the birth of the cinematic apparatus, but is increasingly part of the structuring of media technology in the age of easy-to-use

machines and digital rights management software and platforms. And similarly, hardware, toys and automata from the past can be used in different ways to illustrate, for example, how, through objects, we can interpret the birth of the automated factory system, as with Jessica Riskin’s (2003) reading of the Vaucanson Duck as the key figure in Enlightenment thought and technology. Indeed, to an extent, one could say that it’s not only the curiosity cabinets and such-like that have been a focus of rethinking media and archives through models of heterogeneous order and amazement (see, for example, Stafford and Terpak 2001), but also that media history itself can become such a curiosity cabinet – for better or for worse, as the danger lies in being drawn into writing about ‘curiosities’ for their own sake, instead of asking the simple and critical question ‘why’: why is this particular technology important, and what is the argument behind this research into this curiosity of media history?

Things matter in terms of their politics and how they participate in the constitution of our world. Media hardware can be understood to be important from a variety of perspectives, from design to aesthetics,



**Image 4.1** Media archaeology has focused on a range of objects and apparatuses, often proto-cinematic ones but, increasingly, other forms of technical media such as recording and sound reproduction. In addition to social contexts and, for instance, design, media-archaeological theories are interested in going ‘under the hood’ to investigate the material diagrammatics and technologies of how culture is being mediatically stored and transmitted.

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politics and critical cultural studies. The idea of 'hardware media theory' has been most often connected to the writings of Friedrich Kittler, and the circle of scholars influenced by his post-Foucauldian thoughts concerning media history. He is one of the leading figures of the so-called 'German media theory school' – which is far from a unified school, and more often perceived as such a unity from Anglo-American perspectives in a similar way to how a lot of French philosophy after the 1960s was labelled under the vague category of 'French theory', or 'French poststructuralism'. Of course, in addition to Kittler, there are various other writers – many of them still untranslated into English – who have their own approach to thinking about art, materiality, science and media history (see, for instance, Hagen 2005; Pias 2002; Siegert 2003; Zielinski 2006a; for a critique of Kittler and an alternative cultural historical approach to media art and modernity, see Daniels 2002). In other words, the label 'German' is a sort of misinterpretation, and even relating Kittler's work to a 'Berlin-school of media theory' would neglect a lot of institutional and academic detail. Kittler definitely is not, and never was, the only media theorist in town. Yet, despite continuing inaccuracies in terms of such generalizations as 'German media theory', it is clear that Kittler's writings, which stemmed from his background in literature studies had a huge influence in terms of how international – and especially Anglo-American – media theory considers systems of writing, storage and communication as material networks. As a historical constellation, German media theory, especially in its mix of enthusiasm for close-reading of technological systems and high theory, can be understood as a critical reaction to the Marxist analyses of media by the Frankfurt school, and, on an international scale, as a desire to differentiate from British cultural studies – a point that Geoffrey Winthrop-Young (2006: 88; 2011) articulates well.

Winthrop-Young identifies Kittler alongside, for example, Jochen Hörisch as part of the poststructuralist generation of scholars interested in Foucault, Derrida and Lacan that initially emerged outside any official schools in Germany (Winthrop-Young 2005: 34). Later there was talk of the Kassel school of media theory in which Kittler and others were influential, as well as, since the 1990s, the Berlin (Humboldt University) school of media theory, identified as very materially driven. The generation that turned poststructuralist philosophy into media theory soon carved out an original and radical niche in the disciplinary field. In addition, this intervention in media studies included a strong emphasis on the importance of the scientific and the technological. The German-language use of *wissenschaften* ('sciences'), in their terminology for cultural and media *sciences* as

well is where some of the Kittler-influenced media theory distances itself from cultural *studies* that 'know higher mathematics only from hearsay' (quoted in Winthrop-Young and Wutz 1999: xiv). Such provocations serve to frame the difference between the science- and technology-oriented sciences of culture and the studying of human actions and structures of meaning, which offer a different way of seeing the constructed nature of the cultural world. For Kittler and his like, it is mathematics and engineering that concretely construct worlds through modern technology. As provocations, such critiques of cultural studies, the Frankfurt school and other alternative approaches are often, however, crude generalizations (cf. Winthrop-Young 2011). And yet the ideas are not only about provocations, of course: Kittler can be described as the 'first renegade Germanist to teach computer programming' (Winthrop-Young 2011: 74), and the Berlin Humboldt University Institute for Media Studies is one of the few places that have offered such undergraduate courses as 'Mathematics for Media Studies'.

This division between the special case of Germany and 'the old Europe' (as Kittler might want to have it) and the Anglo-American cultural and media studies feeds into a specific way of understanding media archaeology. To be fair, and to point it out sooner rather than later: Kittler himself has never said he is a media archaeologist, and, more recently, he has announced his difference from the explicitly media-archaeological theory of another Berlin Humboldt University-situated professor, Wolfgang Ernst (Armitage 2006: 32–3). In a short passage in an interview, Kittler discusses briefly the importance of such 'non-linear media history', with which he agrees, but underlines that Ernst's work does not stem from his own. In the interview Kittler continues to talk about the need to think history outside narratives and in terms of what he calls 'the recursive', which clearly has resonances with media-archaeological methods – even that of Huhtamo's (1997, 2011) cyclical and recurring *topoi*. Kittler mentions the Sirens as one such example of recursive history 'where the same issue is taken up again and again at regular intervals but with different connotations and results' (Armitage 2006: 33): from seductive Greek sea nymphs to monsters of early Christianity, from mermaids of the Middle Ages to the nineteenth-century technical use of the term in the form we understand it, i.e. as a signalling device with a loud sound, subsequently playing a key part in the mapping of the thresholds of hearing as well as the development of radio (2006: 33).

But let's step back a bit, and introduce the key points of Kittler's theories about why he has, in the first place, been named as one of the most influential media-archaeological writers, without himself



wanting to be labelled as such. After that, we shall return to how he has afforded and been followed by a range of other thinkers whose media-theoretical and historical writings are of the highest relevance to media archaeology too, and give us insights into materialities of media history. Such ideas resonate with a wider trend in cultural theory called 'new materialism', as well as some other new fields in Anglo-American media studies (software studies, platform studies, media forensics).

Kittler's concept 'discourse networks', from the translation of the same name (originally *Aufschreibesysteme 1800/1900*), was itself an important step towards applying Foucault's methodological positions to media. The two key things that Kittler was able to do and to offer humanities and media studies were: (1) to look at 'old media' such as literature as media systems for transmitting, linking and institutionalizing information (with a nod towards Harold Innis); and (2) to offer insights into how power works in the age of technical media. Indeed, it is through his emphasis on the importance of the technical as a system of inscription, in the manner Foucault talked about, which related to both archaeological (conditions of knowledge) and genealogical (history is inscribed in various bodies, or materials) theories, that the link to media archaeology was born.

The notion of 'discourse networks' and the whole *magnum opus* that was translated in 1990 into English introduced a way to read literature as media, and technical media as a new regime of posthuman sensation and agency. Media, from books to cinema to computers, were not reducible either to content or to sociological conditions, but had to include considerations that took into account how media technologies afford specific forms of perception and modes of memory as well as social relations. By marking radical epistemic breaks *circa* 1800 and 1900, Kittler was not trying to make a historical claim that a clear break in how our technologies and we, 'so-called-humans', change in intimate connection takes place in these specific years, but to map out the epistemic conditions for media. He wanted to produce a mix of Foucauldian archaeology of conditions of knowledge, McLuhan-inspired interest in how media form our sensory and cognitive abilities, and a vision of media history that stems less from social history than from communication physics (for a wonderful elaboration of Kittler's basic ideas, see Winthrop-Young 2011). In other words, as Kittler explicates later in his *Optical Media* lectures (from the late 1990s), it is the engineering communication theory of Claude Shannon (1916–2001) from the 1940s that provides the template for teaching how media work. In other words, not meaning, not representation, not any imaginary of media that is conditioned by the

social, but the act of communication in its physical distributing and effective channelling of signals stands at the core of media, claims Kittler. Communication can hence be methodologically understood through the elements of the Shannon model of: data source, sender, signal, receiver, addressee (see image 5.2). In other words, the process of coding, signal processing and decoding becomes of higher importance in this model, in which Kittler (2010: 44, cf. 1990: 370) underlines that, 'in contrast to traditional philosophy and literary studies, Shannon's model does not ask about the being for whom the message connotes or denotes meaning, but rather it ignores connotation and denotation altogether in order to clarify the internal mechanism of communication instead'. As a sidenote, this focus on science and engineering does not prevent Kittler from using fiction literature – for example Thomas Pynchon's – to illuminate his ideas. That is one of the peculiarities of his style of writing.

*Discourse Networks 1800/1900* was itself an opening to a world of understanding the 'so-called human being' – a world in which the paranoid schizophrenic Judge Schreber (see chapter 3) acts as a good symbol of technical media, and where pioneering use of the typewriter by Friedrich Nietzsche (1844–1900) is indexical of the transformation into a new regime of language and the self. Despite his technological enthusiasm, Kittler is not afraid to use fiction literature and stories – quite often quirky, forgotten ones – to support his analyses into the new regimes of articulation where subjectivity is renegotiated in the complex network of new sciences of sensation and the brain, the new media technologies of moving images (cinema), recording (gramophone and phonograph) and writing (typewriter), and the new arts of such technical media. Hence, the notion of 'network' in the translation, which does not follow directly from the original title *Aufschreibesystem* ('system of inscription'), is apposite: despite often being accused of being a technological determinist in the same way as McLuhan, Kittler's work is more nuanced in its methodological way of tying arts, sciences and technology into a co-constitutive interaction. Technology does not just determine arts, science does not just determine technology, and art is not only creation and contemplation of beauty. They all work in a co-determining network of historical relations where aesthetics is also tightly interwoven with science and technology (cf. Siegert 2008) – although, to be frank, it is mostly science and technology that are emphasized in the last instance. Literature and fiction are more like ways of self-inscription of the media technologies of the age, and a methodological tool for approaching the effects of the hard core of science and technology.



At the end of *Discourse Networks 1800/1900*, Kittler (1990: 369) offers a definition of the concept: 'The term discourse network, as God revealed it to the paranoid cognition of Senate President Schreber, can also designate the network of technologies and institutions that allow a given culture to select, store and process relevant data.' Hence, it is in this link between institutions and technologies that various kinds of agents, signals and processes appear and are posited in systematic relations. Kittler's materialism is thus more than just substance-based, so to speak. He is adamant about a claim that stems from a poststructuralist background (Winthrop-Young and Wutz 1999: xx): we do not speak language, but language speaks us, and we have to participate in such systems of language, which are not of our own making. But language in the age of technical media is not just natural language: it is the new technological and physical regimes introduced by media, such as the typewriter, and later computer software languages, which should methodologically be seen in a similar way – they impose new regimes of sensation and use to which we have to accommodate ourselves in order to be functioning subjects. We are secondary to such systems. Besides agency, this has to do with power. Power is no longer circulated and reproduced solely through spatial places and institutions – such as the clinic or the prison, as Foucault analysed – or practices of language, but takes place in the switches and relays, software and hardware, protocols and circuits of which our technical media systems are made.

### Archaeologies of the material body

Kittler is an important posthuman thinker in how he outlines through careful media-archaeologically tuned analysis the way technical media includes a new agency of the machine. This becomes evident especially when he talks about computer media, and the programmability of media as well as of humans. His approach to poetry of the Romantic period is in a way anachronistic in terms of its method, when he claims that the structuration of the message by such writers as Goethe is actually about *programming* the nation into certain kinds of social and family structures (Winthrop-Young and Wutz 1999: xxi). In the analysis of the discourse network of 1800, the family unit becomes a way of transposing the body in its movement and sound – the movement of the hand in the writing technology of handwriting as an organic flow, and the Mother's Voice as an integral part of the pedagogical discourse which was, in a way, almost transposing the voice of Nature to the learner – as part of the nation-state system that

was educating its pupils into writing. *Bildung* ('education'), as the key word of the Goethe era (and then the emerging Humboldtian university system) is actually programming through teaching the media technology of writing by hand (Kittler 1990: 83–6). So, in other words, even before technical media came along, we had techniques of media – the ways in which we had to learn to use media such as writing and literature, and how that process of learning constituted subjects in the sense that post-structuralism talked about the production of subjects:

The discourse network of 1800 functioned without phonographs, gramophones, or cinematographs. Only books could provide serial storage of serial data. They had been reproducible since Gutenberg, but they became material for understanding and fantasy when alphabetization had become ingrained. Books had previously been reproducible masses of letters; now they reproduced themselves. The scholarly republican heap of books in Faust's study become a psychedelic drug for everyone. (Kittler 1990: 117)

Even such seemingly non-technical regimes of 'media' as handwriting, or for that matter fine arts (Kittler 2010), are technological because they involve techniques of regulating the body and teaching it certain patterns and institutional relations, but also because they engage more with effects and affects of the body rather than producing meanings.

To emphasize, Kittler is not attributing this state of mathematical, non-human media only to digital or technical media. He outlines, for example, the history of analogue practices such as painting as innately mathematical, at least since the development of the linear perspective, evident especially in the art of Filippo Brunelleschi (1377–1446) and inherent in the geometric ways of modelling the world adopted by Leon Battista Alberti (1404–72) – the so-called 'Alberti's window' – which pixelated the world before the raster screen, and offered windows as the worldview before Windows® by Microsoft (Kittler 2010: 54–62; cf. Friedberg 2006). In addition, the hallucinatory aspects of media do not escape Kittler who, as well as seeing Romantic literature as the LSD of that era talks of the Counter-Reformation in the seventeenth century as based on the specific use of visual media to oppose the rationalizing media technology of the Reformation's Gutenberg printing. Counter-Reformation and, for example, the Jesuit order were based, argues Kittler, on the aim 'to overwhelm the five senses' which combined the spiritual order with 'sensual hallucination.' (Kittler 2010: 78; on the history of special effects from the Vatican to the twentieth century, see Klein 2003).

Despite some of the links to debates in new materialism, and being able to offer vocabularies for the materiality of media, Kittler's work has been thoroughly embedded in a Lacanian understanding of this link between the body, the psyche and media. Especially in the early work of *Discourse Networks 1800/1900* and *Gramophone, Film, Typewriter*, Kittler articulates the birth of technical media in terms of the Lacanian triad of psychic spheres: The Real, the Imaginary and the Symbolic – with each corresponding to one key technology of media. So the by-now almost classic phrase (which has spurred the accusations of Kittler being a media determinist), 'media determine our situation, which – in spite or because of it – deserves a description' (Kittler 1999: xxxix), is partly at least to be read from a Lacanian-inspired position. Kittler is interested in how historically changing media constellations, the episteme of media cultures so to speak, activate and modulate our thoughts, sensations, perceptions, memories and, indeed, the way we hallucinate or even go mad. The formula *Lacan + media technology* was the methodology through which, in the early 1980s and 1990s, Kittler tried to connect the psyche to its outside, especially media technology. Nietzsche was one of Kittler's key references early on. The letter from February 1882 stated the principle of all media: 'Our writing tools are also working on our thoughts' (quoted in Kittler 1999: 200). The specific nature of the discrete, spatialized sign is where writing, for Nietzsche, started – along with the whole regime of discrete media as a new era of writing technologies, and technologies of thought in parallel lines.

So the typewriter, originally designed for the blind to assist in their writing, is the Symbolic: a finite and predefined set of signs open to variations from that set. For film, it is the Imaginary that is the primary regime in terms of its psychic and senso-motorial form: it offers a mirror image of the body, writes Kittler. And finally, the Real is revealed most acutely through the recording technologies of sound, which is the medium of coughs, sighs, whispers, stutterings and, in general, what we term 'noise' – the unwanted of communication, which, however, always creeps in as the noisiness of our body, or the material communication channel which produces its own 'waste' (Kittler 1999: 15–16). And yet Kittler moves onwards from this material and mediatic reading of Lacan. Instead of continuing towards the discourse of the Oedipal as the horizon for psychoanalytic explanations, as usual, Kittler is interested in how the actual explanations and theories of Freud and Lacan should be historicized in terms of media technological changes. As we saw earlier, in the previous chapter, he does this to mental illnesses too – so it is only logical to include the theories of mind, psyche and the senso-motorial self in this method

of explanation. Kittler's archaeology and genealogy of the body as the inscription system is not so much interested in food and morals as was Nietzsche, or prisons and the power of medical institutions as was Foucault, but uses the same method to look at inscriptions on the body by media.

The recent years of cultural theory have been talking of 'cognitive capitalism' and affective labour as new regimes of capitalism in which our ways of thinking, communicating and socializing have become key motors for value creation, and hence under new forms of control. Theorists such as Paolo Virno, Maurizio Lazzarato, Franco 'Bifo' Berardi, Tiziana Terranova and others, based on earlier writings by Deleuze, Guattari and other influential thinkers, have claimed that this regime is a new kind of occupying of the psyche – something that Bernard Stiegler (2010) has extended to demands for a new political economy that takes into account psychotechnologies and 'noopolitics'. Despite the interesting connections between such thinkers as Kittler and Stiegler, and the latter's interest in the capitalization of the memory through technologies and their links to capital accumulation and value-creation processes based on capitalist logic, the German media-theoretical stance – and especially Kittler – only implicitly hints at an archaeology of this 'cognitive capitalism'. To simplify: what is often missing from recent political and philosophical analyses in these fields is the medium-specificity and accuracy German media theory does well; although, at the same time, one can say that it is not often that one finds strong articulation of politics in the context of the techno-epistemological research of such media theory. However, the various, complex and often meticulously written analyses of the intertwining of the psychic with the technological also afford ways to think the modern *psychotechnics* as a crucial form of power. In other words, if Michel Foucault's work afforded, on the one hand, extension of archaeological and genealogical methods into media contexts, his writings on biopower and biopolitics have been extended into an analysis of politics of the contemporary media sphere – but we can see that Kittler has already contributed as much to this through an analysis of the technics of the psyche.

As a term, 'psychotechnics' originates from Hugo Münsterberg (1863–1916), the early twentieth-century film theorist pioneer, and the view of cinema as a technology for directly tapping into the unconsciousness of the viewer – modulating the affects, perceptions and psyche of the cinema-goer confronted with technically moving images (Kittler 2010: 175). Cinema is a laboratory of sorts for manipulation of states of mind and brain with the help of methods such as 'close-ups, flashbacks, flashforwards, and reverse shots' (2010: 175) as

well as, more broadly, techniques of time-reversal. Such examples are perfect for Kittler as this enables him to argue for the intimate link between media technologies and the psychology and physiology of the so-called 'human' being. No wonder, as Münsterberg himself was educated in the context of experimental psychology, and hence continued, in media-technological terms, what significant European scientists of the nineteenth century such as Gustav Fechner (1801–87), Hermann von Helmholtz (1821–94) and Wilhelm Wundt (1832–1920) and, in the US, William James (1842–1910) were conceptualizing in writing and in laboratories. In experimental psychology, and in new laboratory settings, an empirically measured human being was born, in contrast to the transcendental subjectivity suggested by Kantian philosophy since the eighteenth century.

The nineteenth-century practices in experimental sciences are in this sense crucial to the way Kittler understands the archaeology of technical media. What such perspectives flag is that we can connect our analyses of digital culture to pre-digital developments. Contemporary media are media of scientific knowledge and products of meticulous works from mathematics to physics labs, as well as experimental psychology settings. As we suggested earlier about Crary concerning a complex methodology of science–technology–arts for media analysis, Kittler also provides similar methods. In short, the place of such seemingly fundamental human qualities as language, communication, feeling and creativity was actually, more or less, in the link between their physiological and neurological basis and how that was mapped in emerging brain sciences, experimental laboratory practices and other measures which made the human body a new object of investigation. What Sigmund Freud (1856–1939) achieved in psychoanalysis and his books but concretely linked to the same discourse networks, i.e. moving from consciousness to the unconscious and subconscious as the fundamental motor of our everyday, also happened through the sciences and media: 'Prior to consciousness, then, there are sensory and motor, acoustical, and optic language centers linked by nerve paths just as the working parts of a typewriter are connected by levers and rods' (Kittler 1990: 251).

Technological media are media of nerves and the unconscious, and the pioneers of such research become media theorists *avant la lettre* (and *avant le McLuhan*). Fechner (interested in the psychophysics of sense perception), Helmholtz (through his various research into acoustics and the perceptual thresholds of the human body), Wundt's similar researches into the nerve basis of our 'being in the world', and other notable physiologists and experimentalists investigated what used to be called 'arts', but for Kittler are now media.

Indeed, it is very emblematic of the Berlin orientation of cultural and media analytics that the Humboldt University's Centre for Cultural Techniques – which one is tempted to see almost as a counterpart to the Birmingham School of Cultural Studies – is called the *Hermann von Helmholtz Centre*. Naturally, this is not the only institutional base where such historical and cultural research into the meticulous conditioning, governing and regulation of sensory data was conducted. Take, for example, the research of such historians of science as Henning Schmidgen, in which the work of Helmholtz and others takes a central place in understanding the building of the culture of technicality. As Schmidgen (2002) shows, Helmholtz was a key figure in starting the mapping of the body as a system of nerves whose reaction times – i.e. how quickly the body conveys the signal through nerves to the brain to process – could be accurately measured, and how this interest in the physiology later extended into more psychological measurements too.

An interest in time, in quickness and slowness at the basis of sensation, was at the core of this phase and the grounding of how we have lived in technical media culture since the nineteenth century (and not least because the apparatuses that were used constitute in themselves proto-mediatic devices for a cyborgian past of sorts). Such suggestions of 'time critical perspectives' emerging in media archaeology (Volmar 2009) point towards the fact that we need to understand the materiality of technical media through temporality. Hence, questions such as how many vibrations a second the tuning fork of a phonograph registers (Schmidgen 2002: 144), how quickly humans and animals can react to stimuli, how we synchronize multiple stimuli to different senses, how media themselves as a sensation system of sorts synchronize and synthesize, for example, discrete registered states into continuous movements, as with film, are at the centre of media archaeologies of temporality.

For Kittler, the emergence of such posthuman agency as cinema as nervous systems in their own right, and the link between nineteenth-century sciences and media, are summed up in his account of technical media through Münsterberg:

everyday reality itself, from the workplace to leisure time, has long been a lab in its own right. Since the motor and sensory activities of so-called-Man (hearing, speaking, reading, writing) have been measured under all conceivable extreme conditions, their ergonomic revolution is only a matter of course. The second industrial revolution enters the knowledge base. Psychotechnology relays psychology and media technology under the pretext that each psychic apparatus is also a technological one, and vice versa. (Kittler 1999: 160)



Such technologies for mapping the body's possibilities and thresholds are themselves the point of entry for new regimes of drilling, training and media pedagogy. We find this emphasis on training of the senses as part of modernity in Walter Benjamin, analysed by Crary (1990: 112) in relation to the phenakistoscope, and emphasized continuously by Kittler in relation to war (1999: 140; see also Winthrop-Young 2011: 132–3).

Kittler (1999: 27) writes about Eliza Doolittle (the literary character in the play *Pygmalion* (1912) by G. B. Shaw (1856–1950)) as a perfect example of the subject of drilling in the discourse network of 1900, where the possibilities of capturing and reversing (spoken) sounds prepare the way for rehearsing their improvement; similarly, what Kittler's perspective affords is a whole new way of looking at the materiality of the body as part of media networks that extend to work (Taylorism and, for example, the 1920s ideas of Frank Gilbreth (1868–1924)), to the military (as the obvious regime of drilling, but also of high-tech media used for logistics, control and communication in the battlefield) and, of course, in the more everyday sense of media, to how we are trained to use and interact with media devices. This is naturally present in the culture of user manuals for hardware and software, as well as, for example, Acceptable Use Policies in online networks. Also the broader questions of design can be connected to this: the earlier work in human–computer interface design and related computing fields since pioneers – such as Douglas Engelbart, Ivan Sutherland, J. C. R. Licklider, Alan Kay and others, working in key institutional sites like the Xerox Palo Alto Labs, MIT, University of Utah and other places – opened up computing as a medium for lay human beings: not only for number-crunching, but for symbol and graphic object manipulation, and hence meant for eyes (graphic user interface screens) and hands (the keyboard, mouse), and encompassing complete ecologies of objects and processes (see Alt 2011; see also Gere 2002).<sup>1</sup>

Psychotechnology as a tool for understanding the archaeology of contemporary software media culture is employed by Claus Pias in his extensive work on computer games. Pias maps the ways of mobilizing the body as part of regimes of control and order: analysing the way our gestures and movement were ordered in the work management context by Frank Gilbreth in the early part of the twentieth century, reading through the conservative writer Ernst Jünger (1895–1998) the extensions of management of work into management of bodies in war, especially by World War II, and then through post-war HCI design the regimes of psychotechnologies of computer culture which prepared the action-perception patterns of humans to be ready

for and attentive to how we should be interacting with the new screen technologies that emerged and later conquered our desktops through software such as games. As Pias (2002, 2011) shows, the history of such seemingly innocent consumer software as games is entangled in histories of science and war, and the management of bodies – a theme that directly stems from the impulse given to media studies and media-archaeological research by Kittler.

In this spirit, one key methodological guideline would be: if you want to understand contemporary media technological culture, look at its science and military contexts, instead of the content of what is consumed as entertainment media. For example, in terms of war, the history of media conflates with that of modern combat:

Phase 1, beginning with the American Civil War, developed storage technologies for acoustics, optics, and script: film, gramophone, and the man-machine system, typewriter. Phase 2, beginning with the First World War, developed for each storage content appropriate electric transmission technologies: radio, television, and their more secret counterparts. Phase 3, since the Second World War, has transferred the schematic of a typewriter of predictability per se; Turing's mathematical definition of computability in 1936 gave future computers their name. (Kittler 1999: 243)

Such a claim is, for sure, controversial, and not entirely historically accurate. Think of the multiplicity of modern technologies from telegraphy to telephony, from visual media to broadcasting, and consider if you can always find only one causal chain that connects them to military contexts. Reducing computer history to the singular point of Turing's invention is as dubious. Yet such generalizations serve a theoretical point, and illuminate the specific way of extending the media-historical agenda into a mapping of the wider modern history of scientific–military institutions and experiments (see Winthrop-Young 2002 and 2011: 129–43 for a thorough explanation and critique of Kittler's relation to war, and media as 'drill and distraction').

In addition to a military perspective, Kittler's viewpoint stems partly from a consideration of such engineering pioneers as Shannon read as a media theorist who prioritizes signal processing over semantics. What's more, this theoretical realization is embedded in the historical development of modern technical media themselves, and should hence guide the way we write about modern media (cf. Gane 2005: 26–8). One can find repercussions of such developments in a variety of German media-theoretical writings, and this is where Kittler's ontological posthumanism stems from: engineering, mathematics and

the primacy of system design over any hermeneutic perspective that looks for interpretation and meaning in the fashion understood by nineteenth-century literature interpreters – or the modern hermeneutics of Gadamer, for that matter. (On recent German media-theoretical writing on Shannon, including on his playlike automata, see Roch 2010.)

### Mathematical media ontology

So what if we should not, paradoxically, start studying media from media but from science and the military, and if we should not start studying media use from human beings, but from something else? Kittler's media-materialistic archaeology can give keys to understanding the modern conflation of communication with technology (Gane 2005: 34), and its implications for information materialism that takes as its starting point a more posthuman position. Bernhard Siegert gives one response to the post-human dilemma of conflation of communications and technology in terms of 'standards', which already *seems* like a slightly 'softer' and more social version of media systems than that of Kittler's. But the link to Kittler is clear too. Siegert manoeuvres around the question of the human and focuses on *systems* of communication, and especially on the postal system as such a discourse network. In the midst of this network, the practice of standardization acted as a surpassing of the Individual as the starting point of posting – and was replaced by the System. More closely, the system worked through technical standards which, in fact, define the self-sustaining circulation of the postal network (Siegert 1999: 108). This (post-)structuralist move assumes not that meaning stems from intentions, or individual acts of interpretation – that there are people using the systems according to their own volition – but that the system is subjecting the user to its structure, or in this case: standards. In other words, language is not the only system of subjectification: we can look at technology, or such institutional networks as the postal system, through a similar methodological prism. To paraphrase Siegert (1999: 109), technology, or standards, precede meaning, and enable it – similarly to how they enable the being of the subject. We exist as postal subjects because of a system, a media system, called 'the post'. In concrete terms, this is what the postal system achieved and what we could then see as an archaeological phase in terms of a surprising genealogy of the posthuman: penny postage in 1840 standardized the (pre)payment, mailboxes standardized the procedure of input to the system, and subsequently the whole routine

of communication travelling through a predefined system as standardized packages ensured a tighter control of the time required for sending and receiving, as well as its spatial coverage within a nation and soon internationally. The posthuman does not always have to be thought through the digital-media discourse of cyborgs and cyberspace, and we can go much further back in time than to computers in our analyses of digital culture. As Siegert notes (1999: 121), the only thing missing from a perfect posthuman machine was some kind of a reading machine at the end and 'all of England's written communication would have been completely standardized and mechanized, from production right through distribution to reception'.

So in other words, only that what can be posted, exists (Siegert 1999: 119). What Siegert proposes is an understanding of the posthuman even before technical media *per se*, but through a more general feature that defines network cultures too: objectification through such *standards* (see Fuller 2005: 93–5) and what Alex Galloway (2004), in a more Internet-specific way, has called the protological nature of contemporary control mechanisms of technicality. It is, of course, unconventional to consider the postal system as indispensable to the way we understand media culture but this is emblematic of what these kinds of media-materialist accounts of communication practices afford: thinking media outside the box, in a variety of guises, and focusing more on the process of mediation and such defining characteristics as standardization at the core of this materiality. This is what media archaeology at its best establishes: a problematization and a rethinking of such fundamental questions as what even counts as media.<sup>2</sup>

But with technical media, the posthuman gains further momentum. To be sure, these media theorists do not refer to this as 'posthuman', which is more an invention of American academic language. But the theoretical link is clear. If Kittler, and others such as Siegert, have established that the Foucauldian and poststructuralist message of the primacy of systems, or institutions, is what posits subjects, a further twist comes with digital media that is at its core mathematical. In Kittler's writings on software culture, he already makes the move concerning archaeologies of the present not only towards a historical reading of how we have ended up in a digital culture, but also in terms of how the machines themselves structure our everyday experiences. Kittler's influential texts, for example 'There is No Software' (1995), outline such ontologies of post-discourse network 1900 technical media now turned digital: a general codification system that is able to turn all media into digital code, and a general numerization and programmability of what the psychophysical media were able to quantify

already. To paraphrase Kittler (1999: 1–2), computers are not only a remediation (cf. Bolter and Grusin 1999) of existing media such as typewriters and film, despite their interfaces (keyboards) and content (audiovisuality), but also introduce new standards in data transfer, programming and storage.

More specifically, this new state for media analysis is outlined in the first lines of Kittler's (1995) software article: texts do not exist any more in time and space that we human beings can perceive, but only in computer memory and, because of that, we no longer have direct access to writing. Due to complexity and high-tech demands, even the building of such machines is no longer understandable with old notions of skill or handcraft, but takes place through Computer-Aided Design, which, furthermore, points to the complexity of the hardware and software environments in which we live. It takes one to build one. Even so, Kittler states in the text that software does not exist, which as a provocative claim suggests the other side of his argument, which stems from the complexity of the structures inside computers. Writing technologies are to be understood no longer through natural languages, but through software languages and programs such as our word-processing ones – during Kittler's writing WordPerfect, but nowadays, more or less, simply Word. Yet, such software programming language turned into applications and programs requires a further layer of operating systems, which themselves, continues Kittler, are to be understood only in relation to the fundamental input and output operations governed through BIOS – the first piece of software that exists and allows the operating system to be bootstrapped into full swing in specific hardware settings. Hence, 'In principle, this kind of descent from software to hardware, from higher to lower levels of observation, could be continued over more and more decades. All code operations, despite their metaphoric faculties such as "call" or "return", come down to absolutely local string manipulations and that is, I am afraid, to signifiers of voltage differences.'

One could do a similar analysis of 'descent' of other mediatic elements as well. For example, as analysed in chapter 2 regarding visual culture, algorithmic constellations of images demand new perspectives. In this context, we can map the existence of a pixel as such an element in post-World War II visual cultures for basic raster screens which form intensities of red, green and blue, and are organized through bitmaps that further assemble them into coordinated systems for the human perception system (Harwood 2008). This is why on the media studies agenda a whole new set of difficult objects demand analysis – such as video codecs (MPEG-1, MPEG-2, M-PEG4, H.264,

DivX, WMW, several of which are based on the H.261 coding standard) that temporally channel and structure how we perceive visuals and sound (Mackenzie 2008; see Cubitt 2010).

Hence, to understand 'descent', which is a key term in Foucault's genealogical method, one does not only track historical descent, but also descent in terms of computer infrastructures, and how the supposedly immaterial notion of software is hooked up to the very material reality of hardware. Media archaeology goes back not only in time, but inside the machine. While there is room for a critical debate about whether this is a 'techno-determinist' view we are talking about,<sup>3</sup> we can flip it to illustrate the important political economic implications of where our computer-age discourse networks are embedded, and how the fact that power is now circulated through software to hardware is inseparable from the proprietary industries that produce the platforms on which our media for seeing and hearing are governed. For Kittler (1997), this leads to an analysis of the 'protected mode' at the core of Intel processors since 80286 was introduced in 1982, which, in contrast to the Real Mode, protected the processor from users. This particular analysis can be seen highlighting a more political side of Kittler's take that taps into the constitutive archaeological features of media technology: that our world is governed not only by language or even the hallucination of control through software languages, but by hardware, and, even more so, the proprietary logic that shuts off the machine from the end user through the protected mode, but also through graphical user interfaces, or application culture as Jonathan Zittrain (2008) has recently argued in relation to Internet and mobile-device culture. In application culture, we do not program anymore, but are programmed, as merely users/consumers of media (see Franklin 2009 on rethinking the division between users and programmers).

More widely, this is, of course, a question of media ontology as mathematical. Through an implicitly rather Derridean supposition, Kittler (2009) maps how Western metaphysics since Ancient Greece has neglected writing, but also mathematics, and hence technology, from its considerations. Yet, in the age of mathematical machines, i.e. computers, we need to rethink such fundamental metaphysical notions as form and matter that we inherited from Aristotle (384–322 BC), and focus more on ontologies of media provided by computer pioneers such as John von Neumann (1903–57). Indeed, the materiality of the informatic machines is suddenly not form and matter, but about *commands*, *addresses* and *data*, the basic structure we have inherited from the von Neumann architecture of computers: registers, busses and random access memory (Kittler 2009: 30).



These are the new architectures of power. Power becomes hardwired to technology.

Wolfgang Ernst (2003, 2011) explicitly places his theoretical work under the banner of media archaeology but, continuing a certain mathematico-materialist emphasis, insists on its difference from narrative writings of the cultural history of media. Mathematics being an underlying ontology of technical media is continued into a media-archaeological method through the interest in numbers and counting, which Ernst sees revived in the age of digital aesthetics. Like so many German media theorists, he does not offer an explicit theory of power in his media archaeology, but focuses on the techno-aesthetics of media. By referring back not only to old etymologies in which 'telling' (as in narratives) and counting coalesce, but also to one of the founding texts of modern writings on art, *Laokoon* (1766) by Gotthold Ephraim Lessing (1729–81), Ernst seems to suggest we need to pay special attention to time-specificity. By understanding the importance of counting, calculation and such processes that point back to the inherent link between mathematics and media, Ernst picks up on the division between spatial arts (painting and sculpture) and time-based arts (narrative). In the age of algorithmics, despite the temptation offered by an increasing visualization and graphical user interface metaphors, we are again in the age of not only time-based, but *time-critical* processes, argues Ernst (2003: 42–4; cf. Ernst 2006). Hence, he moves further from the realization that mathematics and calculation are at the core of technical and digital media, to an elaborated argument that these are time-critical processes, especially when understood through the processual nature of the calculating machine or computer. Time-criticality refers to the internal, creative function of processuality of, for instance, digital machines. Ernst does not reduce computers to calculating machines and neglect the way in which they have become media machines, but argues that the media they offer in terms of visual, textual and sonic phenomena are, at the core, based in quantification, and hence numbers.

Ernst's way of articulating a specifically media-archaeological version of 'media materialism' is then not a direct assault on narrative theories, but a strong insistence on rethinking what we mean by narrative. He detaches it from a solely textual and meaning-based understanding to point towards how narratives and 'telling' are themselves processual *operations*: techniques as part of technological systems. Hence, as Ernst (2005) argues, media archaeology is not cultural history. Such methodologies might develop in parallel lines, but differ from theorists such as Stephen Bann in that the object is no longer people, discourses and narrativization as a method of bringing the

past alive, but the archive. Ernst also differentiates himself from such media archaeologists of the digital as Lev Manovich who, he argues, is still doing linear histories of new media (see Lovink and Ernst 2003) – even if, we could add, Manovich (2001: 218–21) has given keys for a post-narrative way of thinking in emphasizing the database as the foundational form for new media objects and culture.

Indeed, Ernst is perhaps the first – following Walter Benjamin, of course – who explicitly insists on the centrality of the archive for media studies. The archive is a condition of any statement, and archives are monumental in the sense we have seen Foucault already arguing: they record that which has existed. Such recordings become the monument of time in terms of how it conveys documents not as narratives but as concrete, factual objects. This gets further complicated with technical media which accurately record, as Kittler argued regarding the phonograph, all kinds of other things besides meaningful statements. Every kind of storage, recording, carries with it in a very scientific sense as well 'time' and the original event of recording, and hence is non-linear itself. For Ernst, it is in all this that falls outside meaning that media archaeology picks up its epistemology and its methodology: 'Media archaeology concentrates on the non-discursive elements in dealing with the past: not on speakers, but rather on the agency of the machine' (Ernst 2005: 591; see also Ernst 2011). The techno-episteme starts from the machinic archive, even if, problematically, this conceptualization does not extend to discussing the aspects of politics in such an epistemology. We will elaborate on these questions concerning the archive in technical media culture in chapter 6.

Hence, it suffices here to point towards how the mathematics and temporal processuality of mathematics on our laptops, and desktop computers, smart phones, networks wired and wireless, are forcing us to think anew media epistemology. As flagged above, the new understanding of 'descent' is not only genealogical, but archaeological in the sense that a recent wave of media archaeologists have started to look at time-critical processes *inside* the machines and in the circuits of contemporary technology. Media archaeology goes *under the hood*, so to speak, and extends the idea of an archive into actual machines and circuits. Perhaps still hardware enthusiasts, and definitely materialist, but continuing their archaeological methodologies by hardware hacking and circuit bending, this new kind of media archaeologist moves from historical time to machine time such as network routing and channelling, Ethernet traffic rhythms, and processor patterns. This leads both to theoretical perspectives on 'time-criticality' (Volmar 2009) and to media-artistic/hacktivist methodologies such as with the Institute for Algorithmics – also addressed in chapter 7

in the context of media-archaeological methods for creative practice – or the Microresearch Lab and Martin Howse’s methodologies for ‘digital archaeology’, such as ‘carving’ into data – for instance hard-drives. The final subsection of this chapter focuses instead on tying up some of the themes of German media archaeology with currents in contemporary Anglo-American media studies.

### **New media studies: medium-specificity**

As briefly flagged at the beginning of this chapter, the recent years of cultural-theoretical debate have seen a renewed interest in matter, objects, material processes and the posthuman and non-human. The various brands of new materialism are not reducible to the materialism of Marxist theories of the political economy of production forces in their historical development, and they are interested in the intensive materiality of bodies in motion and defined by *movement moving* (evident in the work of Erin Manning and Brian Massumi); the *abstract materialism* that draws from science-and-art collaboration (for example Luciana Parisi’s writings on architecture and embodiment); *political physiology* that looks for connections between the ‘social and the somatic’ (John Protevi); radical empiricism of the wireless experience (Adrian Mackenzie); the writings on science by Manuel Delanda, Donna Haraway and Karen Barad; material feminists such as Rosi Braidotti, Elizabeth Grosz and others; and of course, for example, Bruno Latour’s work that has had a significant influence – in addition to other theorist-philosophers such as Gilles Deleuze – on a rethinking of materiality (see Bennett 2010). Partly, this turn to materiality can be seen to correct the perceived immateriality brought by digital culture, and by what postmodern theories flagged as the abstraction and immaterialization of cultural reality through a new kind of primacy of the sign, from money to simulacry techniques. Such ideas were most visible in the work of Jean Baudrillard. Indeed, modern processes of abstraction and dematerialization can be understood to be having effects as a crisis of the phenomenological, experiencing human body, and also to demand a different vocabulary that would take into account the *new* forms of materialities of the technical media age (Brown 2010).

What we have already seen emerging after the 1990s hype concerning virtuality of the digital culture is a new emphasis on software, platforms and the various relays and multiple media within the notion of ‘digital media’. Hence, this new *medium-specificity* means keeping a more careful eye on the multiple materialities as well, as is evident

in this account by Matthew G. Kirschenbaum concerning electronic media: ‘A bibliographic/textual approach calls upon us to emphasize precisely those aspects of electronic textuality that have thus far been neglected in the critical writing about the medium: platform, interface, data standards, file formats, operating systems, versions and distributions of code, patches, ports, and so forth. *For that’s the stuff electronic texts are made of*’ (quoted in Brown 2010: 56, emphasis in the original).

Hence, it is fruitful to see Kittler and the other ‘media materialists’ of the German school in this context that has insisted on new humanities vocabularies for digital culture. It would be unfair and silly to reduce the plurality of contemporary approaches to Kittler’s influence but still one could elaborate a certain ‘Kittler-effect’. Winthrop-Young (2011: 143–6) critiques the idea of a ‘Kittler-school’ of faithful followers of his work. Instead, he argues, it would more interesting to talk about the Kittler-effect in both German and international (he mentions especially American communication studies) academic discussions concerning media, in which Kittler’s theories have acted as important benchmarks for providing a more solid technological basis for poststructuralist theories (Lacan, Foucault and, we might add, Deleuze), as well as radically historical perspectives on how we understand communication. One key benchmark, I would add, is how we understand the materiality of media from a historical, even archaeological, perspective – and the materiality of technical media, in particular. Despite the at times emphasized desire for distance from Anglo-American (although especially British) cultural and media studies, this Kittler-effect is visible in how some new forms of media studies are also taking bearings from Kittler in terms of the materiality of media. Hence, what we track here as ‘media archaeology’ – and the expansion of the concept – is of relevance for what could now be called, for want of a better term, ‘*new media studies*’ which takes as its driving force the realization of the importance of concrete software and hardware processes and platforms in media studies. It is thus no accident that the more recent wave of new media scholars in the US as well are saying that their work is not ‘about information society, but about the real machines that live within that society’ (Galloway 2004: 17). In cultural studies there has been an emerging discourse concerning the move from the Birmingham tradition of cultural studies to new cultural studies which means that the primary theoretical corpus and reference point consists of more recent theorists – Badiou, Deleuze, Žižek and indeed Kittler – and themes such as posthumanism and transnational and post-Marxism (see Hall and Birchall 2006), and in media studies we can decipher the

existence of a new generation of themes as well. Kittler is included, for sure, but one can also say that a very medium-specific set of ideas is being articulated, from media archaeology to media ecology, and from software studies to platform studies.

With the impact of Kittler, and more recently Ernst, the emphasis on the materiality of the information society through its machines has given tools for expanding the media-archaeological interest of knowledge as well. Media archaeology becomes more than an interest in lost ideas, quirky technology of the past, or the imaginary media of poets and visionaries. In the wake of the Kittler-effect, media archaeology becomes a way to investigate not only histories of technological processes but also the current 'archaeology' of what happens inside the machine. Hence, despite the voiced difference, or uniqueness, of the particular German brand, a range of approaches in the US-based new media studies are picking up on similar points, and extending the original impetus into directions where disciplinary boundaries get further blurred.

Such ideas are evident in directions such as platform studies, software studies, the humanities computing forensics of scholars such as Kirschenbaum, and even in the developments by scholars such as Wendy Hui Kyong Chun. Chun has reflected on the relations of media archaeology to the more Anglo-American visual culture studies and positioned her work somewhere in-between, as a mediation of different streams and academic debates. In her short reflection, visual culture studies represents the more user-orientated approach that also 'treats the interface, or representations of the interface, as the medium' (Chun 2006a: 17). Media archaeology – and Chun identifies this especially with the Berlin school, along the axis of Kittler–Ernst – is, in contrast, interested in how the machine itself posits the screen, the interface, and, on a technical layer, gives us the phenomenological experience of visuals and sounds – a point Ernst (2006) emphasizes in the chapter he wrote for Chun and Keenan (2006). Despite being a simplification, such divisions are good heuristic tools for making sense of the complex interchanges between intellectual traditions and debates.

Indeed, it is fruitful to see the media-archaeological under-the-hood methodology as a link to how visual culture studies paradigms are changing. The rethinking of the visual medium through software, protocols and other technologies of control is at the core of such works as Raiford Guins's (2009) *Edited Clean Version*, which extends to affinities with work by Ernst. Yet, Guins is drawing his impetus from the theories of governmentality of Foucault and the rethinking of power as control by Deleuze, but implementing such ideas through

software and protocol analysis. In other words, if for Foucault the archive was the place where statements and visibilities are controlled, then a logical step, also proposed by such post-Kittler theorists as Ernst, is for us to rethink the machine as the archive: the software, the hardware, the protocols and platforms which form the visibility, the audibility, the statements of what is. What Guins does – and such emerging forms of media studies as platform studies (Montfort and Bogost 2009) and software studies (for example, Wardrip-Fruin 2009) as well, in differing ways – is to bring a new medium-specificity to the analysis of digital media. Guins is able to connect that effectively to the wider political economy of consumer products in the digital age, echoing Kittler's software-writings, and hence to address some of the shortcomings of the German media theorists. Thus, media-materialist writings enable technically specific understandings of aesthetics in terms of television scan lines and graphics systems, of graphics rendering and memory restrictions – as with the Montfort and Bogost (2009) analysis of the 1970s and early 1980s gaming platform Atari VCS – and of the new forms of temporality circulated by the cycles, processes and object and data worlds of computers (Wardrip-Fruin 2009).

Furthermore, such questions are ones not only of *ontology* (What constitute digital media? What are their defining features?), or of *politics* (What are the new forms of control and governmentality in the software age?) but of *methodology*: how do we study such phenomena? As Wardrip-Fruin (2011) continues from a software studies perspective, archaeologies of digital media should not be limited to readings of representations of old digital media, but be able to tap into their defining features, i.e. operationality and processuality. In a manner that resonates strongly with some of the positions taken by Ernst, Wardrip-Fruin (2011: 302–3) writes about digital media archaeology as a way of also understanding futures of digital media studies: we need to develop tools that understand digital media as processual: 'Digital media are not simply representations but machines for generating representations.'

Media archaeology has to be medium-specific, argues Wardrip-Fruin. This is exactly what so many materialist theories of recent years have started to call for: more specific and nuanced analyses of the modalities of materiality in which we are embedded in cultures of abstraction. Kirschenbaum's work is again exemplary of these new waves in media studies that stem from some of Kittler's and related analysis of technical culture but develop it into directions where it rediscovers relevancy for thinking about storage, cultural objects and processes in the age of information technology. Insisting on mapping



their materiality through a close reading method, Kirschenbaum's methodology is here close to what we will address in more detail in chapter 5 concerning the conjunction of rethinking of archives and media-archaeological methods.

Kirschenbaum suggests a methodology and vocabulary for these processes of the informational culture which, again, take as their starting point informational materialities which resist mere apparatus-focus but still are able to tap into the specificity of the time-critical processes in which contemporary cultural products – texts, images, sounds – operate and are stored. Hence, this means a media studies vocabulary that acknowledges that the inscription technologies of our age demand a (digital) humanities understanding of random access, signal processing, differentiability and chronographics, volumetrics, rationalization, atomization, motion-dependency and the non-volatile nature of contemporary regimes of memory (Kirschenbaum 2008: 89). Perhaps contemporary media archaeology of digital culture starts not from the traditional archive, but from the hard drive – a characteristic which Kirschenbaum here describes? Perhaps the future archaeologist does not start her excavations by going to an archive filled with books and documents, but opens up a PC from the 1980s, inspects its circuit board, and starts forensics work on the hard drive.

Such software and hardware activities seems to be an increasing trend in media-archaeological research, and an emerging amount of work is focusing on archaeologies of software and digitality – not as cultures of the immaterial, but very much through the machines, processes – and standards, commands, addresses and data. Indeed, what we have outlined here as some of the contributions of Kittler and the 'Kittler-effect' on media archaeology applies to other ideas emerging in media studies as well and shows how media archaeology has relevance for a wide range of other theories and methodologies of analysis for contemporary media too. Chapter 6 continues these discussions.

### Summary

Friedrich A. Kittler is a key thinker of the material discourse networks of 1800 and 1900 – notions that he developed to understand the specificity of technical media. Even if he did not recognize himself as a media archaeologist, Kittler's work has given key concepts for later developments. More recent theorists such as Bernhard Siegert, Wolfgang Ernst and Claus Pias are continuing similar themes and media-materialist approaches, but similarly a range of 'new

materialist' media studies theories are emerging: software studies, platform studies and others. A variety of media studies methodologies are now insisting that we should not only engage in textual analyses of media culture, but be prepared to tackle what goes on inside the machine as well. The method of 'descent' as Foucault introduced it is becoming adapted not only to historical research, but also to such techniques of analysis of technical media that take the media archaeologist 'under the hood' of software, as well as hardware. From this perspective, media archaeology is a methodology that insists on medium-specificity.

### Further readings

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