Radical Post-humanism
Friedrich Kittler and the Primacy of Technology

Nicholas Gane

> I have this feeling that we should slowly let go of that old dream of sociologists, the one that says society is only made up of human beings. (Kittler in Kittler and Virilio, 2001: 102–3)

> Media theory can dispense with the notion of 'man' left over from the human sciences. (Kittler, 1996a: 737)

FRIEDRICH KITTLER is one of the pioneers of what might be called *media materialism* – an approach that privileges, at all costs, analysis of the material structures of technology over the meanings of these structures and the messages they circulate. While this approach has recently gained in momentum (see, for example, Hayles, 1999, 2002), Kittler's work has yet to enter (at least with any force) into the mainstream of either media studies or sociology. This is partly because of the theoretical complexity of Kittler's approach, which develops out of and extends four traditions that are difficult, even for the specialist reader, to work together: the information theory of Claude Shannon and Warren Weaver, the media analysis of Marshall McLuhan, the psychoanalytic theory of Jacques Lacan, and Michel Foucault's work on power and discourse. The aim of this article is to unravel these different strands of Kittler's thought, and, in so doing, to open debate about the materiality of digital technologies and the possible development of a *post-human* approach to media analysis. The final section of this article considers the challenges such an approach poses to mainstream sociology and media studies today.

Information Theory

Kittler's writings are influenced, above all, by the early information theory (also known as *first-wave* cybernetic theory, see Hayles, 1999) of Claude Shannon, and in particular his 1948 essay 'The Mathematical Theory of Communication'. The significance of this essay, which some have called '*the* foundational text for information theory' (Johnston, 1997: 6), lies in its attempted separation of the *meaning* of communication from the technical, or more specifically *mathematical*, problem of how communication takes place. This approach is formulated as an answer to a basic engineering problem: a communication system must be able to handle the selection of particular messages from a general set, even though the message finally chosen by the user is more than often unknown at the time of the system's design. Shannon and Weaver's solution is to conceive of information in terms of choice and uncertainty, and, in line with this, treat communication as a question of probability rather than of semantics. Communication is explained in mathematical or rather *statistical* terms: a logarithmic measure of information, along with a rate of production and transmission (entropy), is said to be produced when a particular message is chosen from the range of possibilities contained within a given set (just as long as all choices between messages are '*equally likely*', Shannon and Weaver, 1949: 32).

This approach works by assigning the material components (or 'physical counterparts') of a communication system a mathematical function (at which point information theory crosses into cybernetic theory). For Shannon, there are five such components (which have since been reworked many times by theorists as far removed as Jacques Lacan [1988] and Umberto Eco [1989]): the information source, the transmitter, the channel, the receiver and the destination. The first of these, the information source, is simply that entity (human or machine) which produces the message or sequence of messages that is to be communicated. The transmitter then operates on or *encodes* the message so that it can be passed through the physical channel of communication in the form of a signal. Shannon explains: 'In telephony this operation consists merely of changing sound pressure into a proportional electrical current. In telegraphy we have an encoding operation which produces a sequence of dots, dashes and spaces on the channel corresponding to the message' (Shannon and Weaver, 1949: 33). This signal then passes through the channel, which is 'merely the *medium* used to transmit the signal from transmitter to receiver' (1949: 33, emphasis mine), during the course of which it risks modification by unwanted sources of *noise*, so that 'the received signal is not necessarily the same as that sent out by the transmitter' (1949: 65). This uncertainty, in turn, complicates things greatly. For as noise decreases the accuracy of a transmitted signal, thus introducing a degree of loss to the system, information, defined as the range of possibilities contained within the general set of messages (and *divorced from the question of meaning*), increases. This means that with heightened entropy and uncertainty comes an increase in information. Warren Weaver explains: 'It is generally true that when there is noise, the received signal exhibits

greater information – or better, the received signal is selected out of a more varied set than is the transmitted signal' (Shannon and Weaver, 1949: 19). Less in terms of the meaning of any given message may thus mean more in terms of information itself. And this, in turn, defines the function of the final component of the communication system – the receiver – which reconstructs or *decodes* the message from the signal so that it can arrive at its destination ('the person [or thing]' for whom the message was originally intended), even if this message does not arrive in its desired form.

The key aspect of this approach, which has been developed subsequently by figures such as McLuhan and Kittler (who openly acknowledges his debt to Shannon, see for example Kittler, 1992: 67), is that the technical problem of communication ('How accurately can the symbols of communication be transmitted?') is given primacy over semantic or effectiveness problems ('How precisely do the transmitted symbols convey the desired meaning?' or 'How effectively does the received meaning affect conduct in the desired way?') (Shannon and Weaver, 1949: 4). This is because while the semantic aspects of communication are irrelevant to communication as a technical problem (what Weaver calls 'level A'), the accuracy with which individual messages can be transmitted and received directly influences both the meaning of these messages and their capacity to affect conduct as intended. This means that 'signal accuracies' at level A directly condition the possibility of both semantics ('level B') and the sphere of action ('level C'), but not vice versa. Weaver explains: 'any limitations discovered in the theory at level A necessarily apply to levels B and C', and, as a consequence, 'the theory of level A is, at least to a significant degree, a theory of levels B and C' (Shannon and Weaver, 1949: 6). The technological form of transmission – the coding of messages into signals, the physical channel through which messages flow, and the potential for noise to impact upon and distort these messages – is thus taken to be the primary object of study.

This approach is developed in turn by McLuhan (1964). McLuhan drops Shannon and Weaver's focus on the mathematics of information, but at the same time follows the basic line of their argument by prioritizing analysis of the technology of message transmission over interpretation of its content (a move most media analysis is still reluctant to make today; see Kittler, 1996b). In this way, McLuhan's famous declaration that the 'medium is the message' develops the thinking of Shannon and Weaver (for whom there is no real message, only a signal, see Hayles, 1999: 18) by asserting the role of the channel (which Weaver also calls a *medium*) in shaping the content of what is transmitted (rather than vice versa). It is this transformative power which, for McLuhan, is the real message of technology: 'the "message" of any medium or technology is the change of scale or pace or pattern that it introduces into human affairs' (1964: 8). But McLuhan also gives Shannon and Weaver's communication system a further twist, for the information source (the sender) and final destination of communication are dropped from his account. McLuhan's focuses instead on the changes that the channel (medium) introduces in general into *human* affairs, leading to

a position that wavers between a basic humanism (placing 'Man' at the centre of all things) and a more radical post-human stance (human subjectivity is disappearing into the machinery of communication). This tension, in turn, remains unresolved throughout McLuhan's writings: media are 'extensions of man' (1964: 3), while at the same 'all media' are said to 'work us over completely' (McLuhan and Fiore, 1967: 26).

Kittler, in turn, pounces on such slippages in McLuhan's work, while at the same time pushing the latter of these two lines of argument. First, Kittler argues that 'Media determine our situation, which – in spite or because of it – deserves a description' (1999: xxxix). This is a strong statement: media *determine* our situation, and because of this must be subjected to critical analysis. Kittler warns, however, that such analysis is not easy for at least three reasons. First, since the majority of media technologies have military origins (as also argued by Virilio, 1998), their historical details remain, in many cases, classified and thus inaccessible, meaning that there exists a marked distance between what Kittler calls 'files and facts'. Second, media can only be described and analysed through the use of other media (Kittler, 1996b), which in turn means that it is difficult to gain critical distance from the very technologies that are being placed into question (a problem that is also addressed by Scott Lash in his recent *Critique of Information* [2002]). And, third, the historical data produced by new media technologies (and which allow us to analyse their workings) increasingly take the form of binary code, which not only possesses little meaning in itself but also can be, and to some extent has to be, processed by machines. This, in turn, relegates semantics and human action (levels B and C in Weaver's account) to mere effects of system design and data processing, and introduces a new post-human situation:

> Technologies that not only subvert writing, but engulf it and carry it off along with so-called Man, render their own description impossible. Increasingly, data flows once confined to books and later to records and films are disappearing into black holes and boxes that, as artificial intelligences, are bidding us farewell on their way to nameless high commands. (Kittler, 1999: xxxix)

This rather bleak outlook is, in fact, a direct response to McLuhan's project of understanding media, for Kittler (in similar fashion to Shannon) proposes that channels of communication are material technologies and as such do not mean anything in themselves, and thus cannot be 'understood' in an interpretive sense. McLuhan's project of *Understanding Media* (1964) is, for Kittler (1986: 166), based on an 'anthropocentric illusion' (a projection of humanness onto technologies and machines), for meaning is not intrinsic or prior to technology but rather made possible and directed by its presence (as both Shannon and Weaver suggest): 'the dominant information technologies of the day control all understanding and its illusions' (Kittler, 1999: xl). In line with this, Kittler aims not to understand media as such but rather to document the historical conditions of their emergence and the structures of

communication and understanding they subsequently make possible (what might be called the technical a priori). This 'post-hermeneutic' approach (Wellbery, 1990: vii–xvi), which draws heavily on Foucault's writings on discourse (see Gane and Hansen-Magnusson, forthcoming), and which again is in complete accordance with that proposed by Weaver, seeks to open a 'semantics-free space' (Kittler, 1992: 67) in which description and analysis of technological forms come before, and are used in turn to inform, questions of meaning.

This anti-humanist or *post-human* method of analysis is quite different from the subject-centred approaches that are commonly found in traditional (sociological) approaches to media technology (from Weber through to Castells; see Gane, 2004: 2–3). It reverses traditional procedures by reconstructing humanness from the machine world, rather than vice versa:

> What remains of people is what media can store and communicate. What counts are not the messages or the content with which they equip so-called souls for the duration of a technological era, but rather (and in strict accordance with McLuhan) their circuits, the very schematism of perceptibility. (Kittler, 1999: xl–xli)

Kittler and McLuhan here reach a point of convergence: media theory, or in Kittler's terms media *science* (*Medienwissenschaft*), is to focus on the material structures of technologies and the changes these introduce into culture, not the ways in which these are *used* or the content of the messages that pass through them. For Kittler, this means pushing McLuhan's study of media into the digital age so that computers, their storage capacities and their networks are placed at the centre of analysis. It also means extending Shannon's communication system – made up of information source, the transmitter, the channel, the receiver and the destination (which mutate in Kittler's reading into 'the source, sender, channel, receiver and drain of streams of information' [1990a: 370], so that the destination disappears) – by looking at media in terms of their capacity for *storage*. And with this emphasis on storage or technologized *memory*, information is no longer treated as purely a probability function (as it was for Shannon and Weaver), but as a material property that is in no way distinct from the physical components that make it – or the choice between different variables – possible. In view of this, Kittler terms his approach 'information materialism', for it addresses the ways in which information and the communication system here merge into one: information is 'transformed into matter and matter into information' (Kittler, 1997: 126).

Symbolic Machines

Kittler fleshes out these arguments through a series of detailed historical analyses of media technologies that date from the late 18th century onwards (and earlier in the case of optical media, see Gane and Hansen-Magnusson, forthcoming; Kittler, 2002). *Discourse Networks 1800/1900*, perhaps

Kittler's most famous work, analyses the changing structures of communication systems at two key turning points: the years 1800 and 1900. Kittler observes that around 1800 a general shift took place from the closed world of the 'Republic of Scholars', 'a system in which knowledge was defined in terms of authority and erudition' and 'in which patterns of communication followed the lines of social stratification' (Wellbery, 1990: xviii), to a more open system of reading and writing based on the practice of alphabetization, which involves the translation of visible into audible language, or the *oralization* of culture (see Kittler, 1990a: 32–3). In the midst of this shift, the book emerged as a universal medium, one that, for a short time, remained closed to competition from rival media. Kittler explains: 'Aside from mechanical automatons and toys, there was nothing. The discourse network of 1800 functioned without phonographs, gramophones, or cinematographs. Only books could provide serial storage of data' (1990a: 116). This situation soon changed, however, and by 1900 the book's position as the chief storage medium was placed under threat by 'new' technologies such as the gramophone, phonograph and film. Kittler considers each of these in turn, but before doing so looks at the ways in which a more basic technology – the typewriter – transformed practices of writing (and reading), and with this the secondary realm of semantics. Nietzsche's typewriter (which was bought in 1882 due to the philosopher's half-blindness) (see also Kittler, 1990b) is used as an example to show how this technology transformed the physical connection of the writer to the text through the automation of the writing act: 'Whereas handwriting is subject to the eye, a sense that works across distance, the typewriter uses a blind, tactile power' (Kittler, 1990a: 195). The typewriter automated the act of writing and with this inscribed itself onto the author. Beyond this, it changed the materiality of the text itself by organizing writing spatially through the distribution of discrete rather than continuous (as in handwriting) signs (as characters and character spacings are assigned a standard size). This changed 'the relations among signs but also their relation to the empty ground' (Kittler, 1990a: 195), and with this transformed the meaning or content of the written text (Kittler observes, for example, that 'the poem made of black letters behaves quite differently' [1990c: 8]). In line with McLuhan, the technology of writing (in this case the typewriter) is thus shown to shape the material form of the text produced, and with this the subsequent possibility of human understanding. Hence, as Nietzsche (who Kittler calls the 'first mechanized philosopher' [1990b: 195]) observes (using the typewriter he was commenting on): 'Our writing materials contribute their part to our thinking' (cited in Kittler, 1990a: 196).

Kittler explores this connection further in *Gramophone, Film, Typewriter* by looking at the technologies that challenged the privileged position of writing towards the end of the 19th century. He does so by again working from but also against the texts of Michel Foucault. In *Discourse Networks*, Kittler takes issue with Foucault's neglect of the technologies that underpin discourse and which, historically, helped introduce 'a completely new order

of things' (Kittler, 1990a: 352). By way of response, Kittler reasserts the Shannon–Weaver line: books are material devices for producing, processing, transmitting and storing information, and are not the only, or even the primary technology for doing so (especially post-1850). He declares:

> All libraries are discourse networks, but all discourse networks are not books. In the second industrial revolution, with its automation of the streams of information, the analysis of discourses has yet to exhaust the forms of knowledge and power. Archaeologies of the present must also take into account data storage, transmission, and calculation in technological media. Literary criticism can learn from an information theory that has formalized the current stage of technical knowledge, and thus made measurable the performance or limits of information systems. After the destruction of the monopoly of writing, it becomes possible to draw up an account of its functioning. (1990a: 369–70)

Kittler is more sympathetic to Foucault's practice of genealogy, however, and employs it to bring the histories of these neglected discourse networks and their technologies into sight. This is necessary not only because media tend conceal their underlying message (McLuhan) or essence (Heidegger), but because they structure the very language in which description (either of the past or present) is possible (see Kittler, 1996b). In the face of this dilemma, Kittler returns to those points in history at which different media networks entered into competition with one another: where the new has yet to become the new and the old become old. These 'technological thresholds' (Kittler, 1986: 159) which underpin Foucault's famous epistemic shifts are revealing, for they are points at which neither the incoming nor the outgoing system possesses a monopoly over information. This means that the networks themselves (and thus the route to the present) can be described in terms that are no longer possible. Kittler reflects:

> A communications technology . . . whose monopoly is just ending records precisely the following message: the aesthetic of shock. What reached the page of the surprised author between 1880 and 1920 by means of gramophone, film and typewriter – the very first mechanical media – amounts to a spectral photograph of our present as future. (1997: 29)

Just as Foucault presents historical material in its own terms in a bid to disturb our understanding of the present, Kittler's *Gramophone, Film, Typewriter* also exhumes a range of different (largely forgotten) texts that provide a snapshot of the immediate past, including Jean-Marie Guyau's 'Memory and the Phonograph' (1880; see Kittler, 1999: 30–3), Rainer Maria Rilke's 'Primal Sound' (1919; see Kittler, 1999: 38–42), and Salomo Friedlaender's 'Goethe Speaks into the Phonograph' (1916; see Kittler, 1999: 59–68). The aim of this practice is straightforward: to document the ways in which 'Those early and seemingly harmless machines capable of storing and therefore separating sounds, sights, and writing ushered in a technologizing of

information that, in retrospect, paved the way for today's self-recursive stream of numbers' (Kittler, 1999: xl). In this way, Kittler's work, like that of Foucault, takes the form of a *history of the present*.

This history is full of exciting twists. The first of these comes at the very outset of *Gramophone, Film, Typewriter*, where Kittler pushes the logic of McLuhan's theory of remediation (the idea that the forms of all previous media become the content of new media) to the extreme. He does so by arguing that the emergence of new digital technologies and optical fibre networks brings, in turn, the death of media, for all media can, in principle, now be recast into a single medium: the digital form. The logic of media history is thus one (as McLuhan foresaw) of radical *implosion*:

> . . . something is coming to an end. The general digitisation of channels and information erases the differences among individual media. . . . Inside the computers themselves everything becomes a number: quantity without image, sound, or voice. And once optical fibre networks turn formerly distinct data flows into a standardized series of digitised numbers, any medium can be translated into any other. (Kittler, 1999: 1–2)

Kittler's documentation of this remediation process, however, is not simply Foucauldian in approach, for (as stated above) it not only examines the technology of writing itself, but also brings into view the media technologies that crossed and displaced the written archive at the beginning of the 20th century. At this point, there is a second twist: Kittler theorizes these technologies by turning from Foucault to the work of Jacques Lacan (see Bitsch, 2001), in particular to his 1954–5 seminars on 'The Ego in Freud's Theory and in the Technique of Psychoanalysis'. This involves a restatement of the information theory of Shannon and Weaver, for Lacan's theory of the ego is formulated through direct engagement with early cybernetic theory, and makes reference to Shannon (which explains his interest in the Bell Telephone Company; see Lacan, 1988: 82) and also Norbert Wiener (1988: 296). Lacan's writings on this subject have titles such as 'Homeostasis and Insistence', 'Freud, Hegel and the Machine', 'The Circuit', and 'Psychoanalysis and Cybernetics' (the title of his lecture to the Société Française de Psychanalyse delivered on 22 June 1955). The crossover between these two disciplines is taken up, in turn, by Kittler in *Gramophone, Film, Typewriter*, and again in his later work *Draculas Vermächtnis* ('Dracula's Legacy', 1993), particularly in the key chapter 'The World of the Symbolic Machine' (Kittler, 1997: 130–46). The connection of psychoanalytic theory and information theory or cybernetics is complex and cannot be dealt with here at any length. But, in short, there are two main parts to Kittler's argument (which is developed initially in the latter stages of *Discourse Networks*, see Kittler, 1990a: 206–64). The first is that the discourse of psychoanalysis is itself a product of the shifting media networks of the 19th and 20th centuries, not least because psychoanalysis, defined as an information system (with its strategically placed transmitter

and receiver), works through the production, storage and processing of *data*. In Kittler's words:

> Producing psychoanalytic case studies, that is putting into writing what patients said, requires that one record whatever the two censors on and behind the couch want to render unsaid: parapraxes, puns, slips, signifier jokes. . . . it is consistent to define psychoanalytic case studies, in spite of their written format, as media technologies. (Kittler, 1999: 89)

The irony here is that psychoanalysis emerged at precisely the time when the monopoly of print over data storage came to an end (around 1877, with Edison's invention of the phonograph; see Kittler, 1990c: 5). Kittler argues that one reason for this is that the separation of media into the new technologies of telephone, film, phonograph and print (each of which was used in psychoanalytic practice) ushered in a new 'psychic apparatus' that, in turn, opened up new paths into the unconscious (and for recording the subsequent results). In this way, the grid of media prevalent at the turn of the 20th century underpinned the practice and discourse of psychoanalysis from its outset, and, Kittler observes: 'Freud's materialism reasoned only as far as the information machines of his era – no more no less' (1997: 134).

The second part of Kittler's argument, meanwhile, concerns the writings of Lacan, who is claimed to have understood this basic connection between media technology and psychoanalysis, and in turn 'brought psychoanalysis to the level of high-tech' (Kittler, 1997: 135). Kittler follows the spirit of Lacan's (1988: 40–52) 'material definition of consciousness' (which, like information theory, does not start from the question of meaning; see Kittler, 1997: 140) by showing, in turn, how his registers of the real, symbolic and imaginary can be mapped onto an accompanying series of media technologies. In this way, these three registers become part of Kittler's own methodology. The first of these, the *real*, is, for Lacan, that order which is both beyond appearance and outside language, and thus resistant to symbolization of any kind. The same holds for Kittler:

> . . . of the real nothing more can be brought to light than what Lacan presupposed – that is, nothing. It forms the waste or residue that neither the mirror of the imaginary nor the grid of the symbolic can catch: the physiological accidents and stochastic disorder of bodies. (1999: 16)

The medium that accords with this order is, for Kittler, the gramophone, or more precisely the related technology of the phonograph, which records noises, or the workings of the unconscious, 'regardless of so-called meaning' (1999: 85). The *imaginary*, by contrast, is the narcissistic order of the mirror stage, in which the subject is formed and captivated by its own image (even if this turns out to be an effect of the symbolic order). The medium of the mirror stage is thus an optical form, the clearest example of which, for Kittler, is cinema: 'While record grooves recorded bodies and their heinous waste material, the movies took over the fantastic imaginary things that for

a century had been called Poetry' (1990a: 246). And finally, the *symbolic* is the order that begins with the typewriter and leads through to the digital or *new* media today. The symbolic order is independent of all other orders, and marks a turn into a language comprising differentiated, discrete elements, or what might be called *signifiers*. This language is made up of a sequence of signs that, divorced from concrete signifieds (or objects), remain abstract and removed from what Lacan (following Shannon) calls semantics, or the realm of meaning (1988: 305). It is here that the interests of Lacan and Shannon converge. Lacan declares:

> In cybernetics, the notion of the message has nothing to do with what we usually call a message, which always has a message. The cybernetic message is a sequence of signs. And a sequence of signs comes down to a series of 0s and 1s. (1988: 304)

As in cybernetics, what counts in the symbolic order is not meaning, but rather *difference* between discrete elements – the difference between what is and what is not there, or 0/1 (the binary code). This world of code, of symbolic rather than real or imaginary language, is thus not conducive to human understanding as such. Indeed, Lacan declares: 'The symbolic world is the world of the machine' (1988: 47). And, of course, the most advanced of these machines, and the one that defines the very basis of Kittler's (1997: 130–46) 'world of the symbolic', is Turing's 'universal discrete machine' (which can simulate all other machines): the computer.

Power Circuitries

Kittler's work from the 1990s onwards calls this 'new' digital technology into question by introducing a further theme of cybernetic theory: *control*. This work is diametrically opposed to that of Habermas (1984), who in his epic *Theory of Communicative Action* argues for a basic separation of communicative and instrumental reason. For Kittler, this is not possible on two grounds. First, as argued above, there can be no fundamental division between technology and communication (between communication and its *instruments*), and this holds even for the practice of writing: 'Every reflection on what writing is makes evident that every complex language, to the extent that it has to be a written language, can never be what it is without technology, that is, writing' (Kittler, 1992: 68). And, second, embedded within media technologies (be it a text or the chipset of a computer) are *power* structures that elude the control of the user and configure the basis of communication from within (thereby introducing the term 'instrumental' in the Weberian sense of the term, implying a relation of domination). The introduction of this second dimension shifts Kittler's work, in turn, from a largely descriptive account of the material basis of communication to a critical analysis of the underlying connection of power and technology. This new approach is coupled with an explicit concern for the dynamics of new (digital) media technologies, rather than for the historical emergence and

differentiation of discourse networks in general. Two chapters of Kittler's book *Draculas Vermächtnis* ('Dracula's Legacy') frame this shift: 'There Is No Software' (1999: 147–55) and 'Protected Mode' (1999: 156–68).

The former of these pieces – 'There Is No Software' – is in many ways an extension of Kittler's earlier reading of McLuhan, for it proposes that the medium or *hardware* of digital technology structures the content it processes, not vice versa. McLuhan warned that this fundamental connection between the medium and its message could easily slip from view, not least because the content of communication (the message) tends to blind us to the technology that makes communication itself possible (the medium, which, for McLuhan, is the real message): TV programmes, for example, blind us to the very fact that we are watching TV. Kittler shares this worry, and responds by extending the logic of McLuhan's argument to the study of digital technologies. He starts out by observing that the recent explosion in commercial software conceals an accompanying process of implosion at the level of hardware. First, media are becoming physically smaller as the forms of past technologies are remediated into the content of new media (for example, the phone, the fax, the camera, the VCR can all be contained within a palm-held personal computer). Second, and what makes this possible, the content of all communication is now reducible to binary code so that storage disappears from the human eye, and can be processed by machines that follow their own, pre-programmed rules of operation. These rules, or operation codes, tend to be hidden from view for they are burnt into the circuitries of the technology itself, and lie concealed deep beneath the graphical user interfaces (GUIs) common to most software packages. As a result, Kittler argues that users of digital technologies remain, for the most part, unaware of the hardware operations that structure basic usage, and thus of the power structures built into this technology. In a key passage he declares:

> Programming languages have eroded the monopoly of ordinary language and grown into a new hierarchy of their own. This postmodern Tower of Babel reaches from simple operation codes whose linguistic extension is still a hardware configuration, passing through an assembler whose extension is this very opcode, up to high-level programming languages whose extension is that very assembler. In consequence, far-reaching chains of self-similarities in the sense defined by fractal theory organize the software as well as the hardware of writing. What remains a problem is only recognizing these layers which, like modern technologies in general, have been explicitly contrived to evade perception. We simply do not know what our writing does. (Kittler, 1997: 148)

Software, then, does of course exist, but only as the effect of an underlying hardware, and this hardware, as Kittler observes, conceals itself through the course of its own operation. Kittler here speaks of a 'system of secrecy' in which each physical layer of the machine, from the basic input–output system (BIOS) upwards, hides the one immediately beneath it. For example, the direct operating system (DOS) of the personal computer hides the BIOS

which enables this system to run, and applications (such as WordPerfect) hide, in turn, the workings of DOS. The end result of this upward spiral is the illusion that there is nothing other than software, for the underlying hardware of the machine remains hidden from both the user and the programs executed (through, for example, the separation of algorithms and their results). This system of closure reaches its highest form, first, with the emergence of GUIs, which, for Kittler 'hide a whole machine from its users' (1997: 151) and, second, with the accompanying implementation of protection software, which prevents '"untrusted programs" or "untrusted users" from . . . access[ing] . . . the operating system's kernel and input/output channels' (Kittler, 1997: 151). These developments lead Kittler to invert Shannon's famous theory of entropy, for now the minimization of noise is accompanied at the same time by a minimization of information.

Kittler explores this hidden world of system codes further in his writings on the 'protected mode'. In technical terms, the protected mode is a mode of operation that (in contrast to the earlier design of 'real mode' systems) enables access to extended (32-bit) memory along with the possibility of multitasking in a stable environment. In more general terms, the protected mode refers to a series of built-in functions that are designed to 'protect' the operating system and machine from its users:

> it means that you can't just expect that everything in the computer is there for you to mess with. You can't just take over an interrupt. You can't just change the video settings. You can't just change the CPU's operating mode. (Delorie, n.d.)

While on the face of it the protected mode promises greater computing power, Kittler objects to its underlying authoritarianism, to the way it defines and controls the perimeters and possibilities of a given system. True, there are communities of hackers who seek to open out such systems through techniques of reverse engineering ('figuring out what software that you have no source code for does in a particular feature or function'; see Perry and Oskov, n.d.), but, for the most part, users engage with computers at the level of software, blissfully unaware of the programs and processes that run beneath it. Kittler here reminds us that the apparent 'user-friendliness' of commercial software and systems is achieved at a cost, for it is the product of a range of deep-seated power structures and 'one-way functions' that structure usage according to pre-defined 'priorities, prohibitions, privileges and handicaps' (1997: 160). These structures are self-concealing for they are pre-programmed (burnt) into the kernel of the system itself (meaning that to some degree they are immune to user intervention or 'hacking'), and place restrictions on what the user may or may not alter or even see: 'one can no longer examine the operands of the operations' (Kittler, 1997: 158). Software, as stated above, plays a vital role here by hiding the underlying processes of the machine from immediate view, while at the same time giving the impression of openness. Kittler gives the

example of programs or *daemons* that run behind applications, and which structure possible usage while remaining out of view: 'You never see them, and yet they're constantly doing something for you, like the angel in the mediaeval *Angelo Loci*' (Kittler in Kittler and Virilio, 2001: 102). Kittler's basic position, then, is that while computer-based technologies promise heightened interactivity, in fact they introduce and conceal processes of subjugation in the interplay between hardware and software. In this way, the pre-programmed machine is seen to take control of the user, not the reverse (as is generally assumed): 'the commands of the applications we use command *us*' (Ostrow, 1997: ix).

Post-human Challenges

Kittler's position here might be termed post-human in orientation, but in a quite different way to that of N. Katherine Hayles (perhaps the key thinker in this field). On the face of it, Hayles and Kittler share the same starting point: a critical reading of first-wave information theory. Like Kittler, Hayles questions many of the liberal presuppositions that underpin early informa-tion theory and cybernetics, along with the basic assumption that informa-tion can be abstracted from all underlying material contexts, conditions and practices. But where she departs from Kittler is in her emphasis on the human *body*. For Hayles, the post-human cannot be thought of outside the bodily practices through which information is brought into the material world:

> I view the present moment as a critical juncture when interventions might be made to keep disembodiment from being rewritten, once again, into prevail-ing concepts of subjectivity. I see the deconstruction of the liberal humanist subject as an opportunity to put back into the picture the flesh that continues to be erased in contemporary discussions about cybernetic subjects . . . my dream is a version of the posthuman that embraces the possibilities of infor-mation technologies without being seduced by fantasies of unlimited power and disembodied immortality . . . (Hayles, 1999: 5)

Her aim, then, is not to show either that 'man' is a machine or that a machine can 'function like a man' (the obsession of early cybernetic theorists such as Norbert Wiener; see Hayles, 1999: 7), but rather, on the one hand, to demonstrate the limitations of liberal conceptions of the human that place 'man' in control (1999: 288) and, on the other, to assert the continued exis-tence of the human body by bringing into view the material practices and interfaces through which bodies and machines meet (for machines 'remain distinctively different from humans in their embodiments' [1999: 284]).

While Kittler is sympathetic to the former of these two aims (the shat-tering of the illusion of increased human control), he is hostile to the latter (the attempt to place embodiment at the centre of analysis). For whereas Hayles critiques the abstractness of information theory through an emphasis upon the materiality of the human body, Kittler's media materialism moves

in a different direction: from information theory to an analysis of the physical components of communication systems: 'Let us forget humans, language and sense and instead turn to the details of the five elements and functions of Shannon' (Kittler, 2002: 44). In this approach, there is no attempt to prioritize embodiment, first, because the boundaries between bodies and machines are no longer clear (if they ever were): 'The age of media . . . renders indistinguishable what is human and what is machine . . .' (Kittler, 1999: 146). And, second, even if the human body continues to exist, it, together with the very idea of humanness, is taken to be a construction or effect of technology rather than an agentic force in its own right. Once again:

> What remains of people is what media can store and communicate. What counts are not the messages or the content with which they equip so-called souls for the duration of a technological era, but rather (and in strict accordance with McLuhan) their circuits, the very schematism of perceptibility. (Kittler, 1999: xl–xli)

In line with McLuhan, Kittler's primary interest is in technology and its power to introduce changes into (post-)human life and culture, not vice versa. But, at the same time, Kittler argues that McLuhan does not go far enough, for his definition of a medium as an extension of 'man' continues to place the human body at the centre of things: 'McLuhan, who was by trade a literary theorist, understood more about perception than about electronics, and for that reason attempted to think about technologies from the perspective of the body and not vice versa' (2002: 21). It is on this point that Kittler departs from McLuhan and from all human-centred media theory (including media studies that centre on either the user or *audience*), including that of Hayles, which, in spite of its emphasis on the ways bodies and machines construct each other, still tends to prioritize the material practices of the former over transformative powers of the latter (although this is less the case in her recent *Writing Machines*, 2002).

By extension, Kittler's radical post-humanism also attacks the humanistic underpinnings of mainstream sociology and social theory. His approach refuses to read technology as something socially produced (the humanistic Marxist reading) or as something that is relevant insofar as it is subjectively meaningful (the Weberian line). Rather, it analyses the very technologies that make both *the social* and *meaning* possible. This reverses the traditional direction of social and cultural theory so that technology is now said to be the driving force behind, rather than a controllable outcome of, so-called 'social action'. This approach rests on the construction of the 'human' (which is now something that is to be explained rather than presupposed) from analysis of technologies (for example, operating systems and electronic circuitries), rather than the reverse. Kittler employs precisely this methodology in his analysis of power: 'To begin with, one should attempt to abandon the usual practice of conceiving of power as a function of so-called society, and, conversely, attempt to construct sociology from the chip's architectures'

(Kittler, 1997: 162). Such an approach is pressing as machines (in particular digital media) gain increased powers to structure societal processes and systems irrespective of human agency. These powers are now widespread: from geographical information systems (GIS) that construct and classify physical places and populations through mechanized systems that to some extent are self-forming, through to smart Internet packages that structure system design by 'learning' from past patterns of use. Although fully mech-anized (autopoietic) systems – in this case, autonomous systems that can run and evolve independently of human intervention or design – might be some way off (if they are indeed realizable), the logic of Kittler's argument is clear: the increased and often invisible powers of technological systems to structure that space traditionally thought of as being 'human' (and by extension 'social') are to be placed at the centre of critical analysis. Kittler here goes beyond simply an argument for the recognition of object-agency (an argument expressed in quite different ways by thinkers such as Bruno Latour, Jean Baudrillard and even Marx in his theory of commodity fetishism) to declare that media technologies are more than just objects; they are *processors* of information. In view of this, the internal logics and coded routines through which such technologies work are to be studied by sociologists and media theorists alike. The way forward is for sociologists to think not just about 'people', or computers as such, but also 'programs' (Kittler in Kittler and Virilio, 2001: 103), and Kittler gives similar advice to students of media and cultural studies: 'They should at least know some arithmetic, the integral function, the sine function – everything about signs and functions. They should know at least two software functions' (n.d.). Kittler's emphasis, then, is on the crossing of analysis of the physical workings of the components of a given communication system with (especially in the case of digital media) the study of how these components function at the levels of mathematics and code. This, in turn, forms the basis of a new method for studying (intelligent) machines, what he terms *infor-mation materialism*.

Conclusion

Kittler's basic insistence that technology possesses the power to shape and control human lives, along with our very ability to think critically about what 'technology' and the 'human' actually are, poses a number of urgent ques-tions to conventional forms of media studies and sociology. Rather than focus on the meanings audiences or users attach to objects or machines, for example, Kittler reverses the situation by looking both at the ways in which meanings are generated by an underlying technological framework (the post-hermeneutical approach) and at the ways, subsequently, that these technolo-gies exercise control over their users (the 'protected mode' is one example). At the same time, he questions the common presumption that the 'human', and by extension 'the social', are timeless forms that are resistant to tech-nological intervention. In an age of intelligent machines, for example, what does it mean to be *human* or *social*? How is the human or the social brought

to life and sustained by various technologies across time? And at what point do technologically mediated relations become specifically *social* relations? These pressing questions are brought to the fore by Kittler's post-humanist approach, which dispenses with the discrete human actor or subject as an a priori category and looks instead at the ways in which both the language and embodiment of subjectivity are made possible, transformed and perhaps even effaced by different technologies. Some might object to the strong technological determinism of this position, but in an age in which decisions increasingly are made for us by media systems we have little choice but to use (even in the *processing* of this text), such determinism can no longer be dismissed out of hand. For as machines 'learn' to design and communicate with other machines with little human input, and shape all aspects of the lived environment (from the cars we drive – which increasingly drive us and maintain themselves – to the neighbourhoods we live in, which are structured to an even greater extent by geographical information systems) the power of technologies to determine human life is becoming ever clearer. The task that remains is to unmask the possibilities and dangers contained within this situation, which, for Kittler, demands close historical study of machines, programs and codes. For this to happen, however, human subjects cannot be placed at the starting point or centre of all analysis, but thought of instead in connection to objects, technologies and even forms of information that increasingly have their own power.[1] This, in turn, demands the development of what might be called *post-human* sociology.

Note

1. See, for example, Scott Lash's idea that 'information is alive' in Nicholas Gane's *The Future of Social Theory* (2004: 94–108).

References

Bitsch, A. (2001) *Always Crashing in the Same Car: Jacques Lacans Mathematik des Unbewussten*. Weimar: VDG.

Delorie, D. (n.d.) 'Guide: What Does Protected Mode Mean?' Online, URL (consulted June 2004) http: //www.delorie.com/djgpp/doc/ug/basics/protected.html/

Eco, U. (1989) *The Open Work*. Cambridge, MA: Harvard University Press.

Gane, N. (2004) *The Future of Social Theory*. London: Continuum.

Gane, N. and H. Hansen-Magnusson (forthcoming) 'Materiality is the Message?', *Theory, Culture & Society*.

Habermas, J. (1984) *The Theory of Communicative Action*, 2 vols. Cambridge: Polity.

Hayles, K. (1999) *How We Became Posthuman*. Chicago, IL: University of Chicago Press.

Hayles, K. (2002) *Writing Machines*. Cambridge, MA: MIT Press.

Johnston, J. (1997) 'Friedrich Kittler: Media Theory after Poststructuralism' (Introduction), in F. Kittler, *Literature, Media, Information Systems*. Amsterdam: G+B Arts.

Kittler, F. (1986) 'A Discourse on Discourse', *Stanford Literary Review* 3(1): 157–66.

Kittler, F. (1990a) *Discourse Networks 1800/1900*. Stanford, CA: Stanford University Press.

Kittler, F. (1990b) 'The Mechanized Philosopher', in L.A. Rickels (ed.) *Looking After Nietzsche*. Albany: State University of New York Press.

Kittler, F. (1990c) 'Benn's Poetry', *SubStance* 61: 5–20.

Kittler, F. (1992) 'Spooky Electricity', *Artforum* December: 66–70.

Kittler, F. (1993) *Draculas Vermächtnis: Technische Schriften* [Dracula's Legacy: Technical Writings]. Leipzig: Reclam.

Kittler, F. (1996a) 'Technologies of Writing/Rewriting Technology', *New Literary History* 27(4): 731–42.

Kittler, F. (1996b) 'The History of Communication Media', *CTheory*, URL (consulted March 2005) http: //www.ctheory.net/text_file.asp?pick=45/

Kittler, F. (1997) *Literature, Media, Information Systems*. Amsterdam: G+B Arts.

Kittler, F. (1999) *Gramophone, Film, Typewriter*. Stanford, CA: Stanford University Press.

Kittler, F. (2002) *Optische Medien* [Optical Media]. Berlin: Merve.

Kittler, F. and P. Virilio (2001) 'The Information Bomb: A Conversation', in J. Armitage (ed.) *Virilio Live*. London: Sage.

Lacan, J. (1988) *The Seminar of Jacques Lacan, Book II: The Ego in Freud's Theory and the Technique of Psychoanalysis 1954–1955*. Cambridge: Cambridge University Press.

Lash, S. (2002) *Critique of Information*. London: Sage.

McLuhan, M. (1964) *Understanding Media*. London: Routledge.

McLuhan, M. and Q. Fiore (1967) *The Medium is the Massage: An Inventory of Effects*. New York: Bantam Books.

Ostrow, S. (1997) 'Friedrich Kittler: The Passage from Network to Narrative' (Preface), in F. Kittler, *Literature, Media, Information Systems*. Amsterdam: G+B Arts.

Perry, M. and N. Oskov (n.d.) 'Introduction to Reverse Engineering Software', URL (consulted August 2004) http: //www.acm.uiuc.edu/sigmil/RevEng/ch01.html/

Shannon, C. and W. Weaver (1949) *The Mathematical Theory of Communication*. Urbana: University of Illinois Press.

Virilio, P. (1998) *Pure War*. New York: Semiotext(e).

Wellbery, D. (1990) 'Foreword', in F. Kittler, *Discourse Networks 1800/1900*. Stanford, CA: Stanford University Press.

Nicholas Gane is Senior Lecturer in Sociology and Communications at Brunel University, UK. His publications include *Max Weber and Postmodern Theory* (Palgrave, 2002), *Roland Barthes* (Sage, 2004, co-edited with Mike Gane) and *The Future of Social Theory* (Continuum, 2004).