

1 New Media and New Technologies

1.1 New media: do we know what they are?

This book is a contribution to answering the question, 'What is new about "new media"?' It also offers ways of thinking about that question, ways of seeking answers. Here, at the outset, we ask two prior questions. First, 'What are media anyway?'. When you place the prefix 'new' in front of something it is a good idea to know what you are talking about and 'media' has long been a slippery term (we will also have a lot to say about that in various parts of the book). Second, what, at face value and before we even begin to interrogate them, do we include as 'new media'?

1.1.1 Media studies

For some sixty years the word 'media', the plural of 'medium', has been used as a singular collective term, as in 'the media' (Williams 1976: 169). When we have studied the media we usually, and fairly safely, have had in mind 'communication media' and the specialised and separate institutions and organisations in which people worked: print media and the press, photography, advertising, cinema, broadcasting (radio and television), publishing, and so on. The term also referred to the cultural and material products of those institutions (the distinct forms and **genres** of news, road movies, soap operas which took the material forms of newspapers, paperback books, films, tapes, discs: Thompson 1971: 23–24). When systematically studied (whether by the media institutions themselves as part of their market research or by media academics inquiring critically into their social and cultural significance) we paid attention to more than the point of media production which took place within these institutions. We also investigated the wider processes through which information and representations (the 'content') of 'the media' were distributed, received and consumed by audiences and were regulated and controlled by the state or the market.

We do, of course, still do this, just as some of us still watch 90-minute films, in the dark, at the cinema, or gather as families to watch in a fairly linear way an evening's scheduled 'broadcast' television. But many do not consume their 'media' in such ways. These are old habits or practices, residual options among many other newer ones. So, we may sometimes continue to think about media in the ways we described above, but we do so within a changing context which, at the very least, challenges some of the assumed categories that description includes.

For example, in an age of trans-mediality we now see the migration of content and intellectual property across media forms, forcing all media producers to be aware of and collaborate with others. We are seeing the fragmentation of television, the blurring of boundaries

For more on these particular developments see: 3.16, 3.22, 3.23

(as in the rise of the 'citizen journalist'); we have seen a shift from 'audiences' to 'users', and from 'consumers' to 'producers'. The screens that we watch have become both tiny and mobile, and vast and immersive. It is argued that we now have a media economics where networks of many small, minority and niche markets replace the old 'mass audience' (see The Long Tail 3.13). Does the term 'audience' mean the same as it did in the twentieth century? Are media genres and media production skills as distinct as they used to be? Is the 'point of production' as squarely based in formal media institutions (large specialist corporations) as it used to be? Is the state as able to control and regulate media output as it once was? Is the photographic (lens based) image any longer distinct from (or usefully contrasted to) digital and computer generated imagery?

However, we should note right now (because it will be a recurring theme in this book), that even this very brief indication of changes in the forms, production, distribution, and consumption of media is more complex than the implied division into the 'old' and 'new' suggest. This is because many of these very shifts also have their precedents, their history. There have long been minority audiences, media that escape easy regulation, hybrid genres and 'inter-texts' etc. In this way, we are already returned to the question 'What is "new" about "new media"?' What is continuity, what is radical change? What is truly new, what is only apparently so?

Despite the contemporary challenges to its assumptions, the importance of our brief description of 'media studies' above is that it understands media as fully social institutions which are not reducible to their technologies. We still cannot say that about 'new media', which, even after almost thirty years, continues to suggest something less settled and known. At the very least, we face, on the one hand, a rapid and ongoing set of technological experiments and entrepreneurial initiatives; on the other, a complex set of interactions between the new technological possibilities and established media forms. Despite this the singular term 'new media' is applied unproblematically. Why? Here we suggest three answers. First, new media are thought of as epochal; whether as cause or effect, they are part of larger, even global, historical change. Second, there is a powerful utopian and positive ideological charge to the concept 'new'. Third, it is a useful and inclusive 'portmanteau' term which avoids reducing 'new media' to technical or more specialist (and controversial) terms.

1.1.2 The intensity of change

The term 'new media' emerged to capture a sense that quite rapidly from the late 1980s on, the world of media and communications began to look quite different and this difference was not restricted to any one sector or element of that world, although the actual timing of change may have been different from medium to medium. This was the case from printing, photography, through television, to telecommunications. Of course, such media had continually been in a state of technological, institutional and cultural change or development; they never stood still. Yet, even within this state of constant flux, it seemed that the nature of change that was experienced warranted an absolute marking off from what went before. This experience of change was not, of course, confined only to the media in this period. Other, wider kinds of social and cultural change were being identified and described and had been, to varying degrees, from the 1960s onwards. The following are indicative of wider kinds of social, economic and cultural change with which new media are associated:

- **A shift from modernity to postmodernity:** a contested, but widely subscribed attempt to characterise deep and structural changes in societies and economies from the 1960s

onwards, with correlative cultural changes. In terms of their aesthetics and economies new media are usually seen as a key marker of such change (see e.g. Harvey 1989).

- **Intensifying processes of globalisation:** a dissolving of national states and boundaries in terms of trade, corporate organisation, customs and cultures, identities and beliefs, in which new media have been seen as a contributory element (see e.g. Featherstone 1990).
- **A replacement, in the West, of an industrial age of manufacturing by a 'post-industrial' information age:** a shift in employment, skill, investment and profit, in the production of material goods to service and information 'industries' which many uses of new media are seen to epitomise (see e.g. Castells 2000).
- **A decentring of established and centralised geopolitical orders:** the weakening of mechanisms of power and control from Western colonial centres, facilitated by the dispersed, boundary-transgressing, networks of new communication media.

New media were caught up with and seen as part of these other kinds of change (as both cause and effect), and the sense of 'new times' and 'new eras' which followed in their wake. In this sense, the emergence of 'new media' as some kind of epoch-making phenomena, was, and still is, seen as part of a much larger landscape of social, technological and cultural change; in short, as part of a new **technoculture**.

1.1.3 The ideological connotations of the new

There is a strong sense in which the 'new' in new media carries the ideological force of 'new equals better' and it also carries with it a cluster of glamorous and exciting meanings. The 'new' is 'the cutting edge', the 'avant-garde', the place for forward-thinking people to be (whether they be producers, consumers, or, indeed, media academics). These connotations of 'the new' are derived from a modernist belief in social progress as delivered by technology. Such long-standing beliefs (they existed throughout the twentieth century and have roots in the nineteenth century and even earlier) are clearly reinscribed in new media as we invest in them. New media appear, as they have before, with claims and hopes attached; they will deliver increased productivity and educational opportunity (4.3.2) and open up new creative and communicative horizons (1.3, 1.5). Calling a range of developments 'new', which may or may not be new or even similar, is part of a powerful ideological movement and a narrative about progress in Western societies (1.5).

This narrative is subscribed to not only by the entrepreneurs, corporations who produce the media hardware and software in question, but also by whole sections of media commentators and journalists, artists, intellectuals, technologists and administrators, educationalists and cultural activists. This apparently innocent enthusiasm for the 'latest thing' is rarely if ever ideologically neutral. The celebration and incessant promotion of new media and **ICTs** in both state and corporate sectors cannot be dissociated from the globalising **neo-liberal** forms of production and distribution which have been characteristic of the past twenty years.

1.1.4 Non-technical and inclusive

'New media' has gained currency as a term because of its useful inclusiveness. It avoids, at the expense of its generality and its ideological overtones, the reductions of some of its

4.3.2 Edutainment, edutainment, edutainment
1.3 Change and continuity
1.5 Who was dissatisfied with old media?

Case study 1.3 What is new about interactivity?

alternatives. It avoids the emphasis on purely technical and formal definition, as in 'digital' or 'electronic' media; the stress on a single, ill-defined and contentious quality as in 'interactive media', or the limitation to one set of machines and practices as in 'computer-mediated communication' (CMC).

So, while a person using the term 'new media' may have one thing in mind (the Internet), others may mean something else (digital TV, new ways of imaging the body, a virtual environment, a computer game, or a blog). All use the same term to refer to a range of phenomena. In doing so they each claim the status of 'medium' for what they have in mind and they all borrow the glamorous connotations of 'newness'. It is a term with broad cultural resonance rather than a narrow technician or specialist application.

There is, then, some kind of sense, as well as a powerful ideological charge, in the singular use of the term. It is a term that offers to recognise some big changes, technological, ideological and experiential, which actually underpin a range of different phenomena. It is, however, very general and abstract.

We might, at this point, ask whether we could readily identify some kind of fundamental change which underpins all new media – something more tangible or more scientific than the motives and contexts we have so far discussed. This is where the term 'digital media' is preferable for some, as it draws attention to a specific means (and its implications) of the registration, storage, and distribution of information in the form of digital binary code. However, even here, although digital media is accurate as a formal description, it presupposes an absolute break (between **analogue** and digital) where we will see that none in fact exists. Many digital new media are reworked and expanded versions of 'old' analogue media (1.2.1).

1.1.5 Distinguishing between kinds of new media

The reasons for the adoption of the abstraction 'new media' such as we have briefly discussed above are important. We will have cause to revisit them in other sections of this part of the book (1.3, 1.4, 1.5) as we think further about the historical and ideological dimensions of 'newness' and 'media'. It is also very important to move beyond the abstraction and generality of the term; there is a need to regain and use the term in its plural sense. We need to ask what the new media are *in their variety and plurality*. As we do this we can see that beneath the general sense of change we need to talk about a range of different kinds of change. We also need to see that the changes in question are ones in which the ratios between the old and the new vary (1.3).

Below, as an initial step in getting clearer about this, we provide a schema that breaks down the global term 'new media' into some more manageable constituent parts. Bearing in mind the question marks that we have already placed over the 'new', we take 'new media' to refer to the following:

- **New textual experiences:** new kinds of **genre** and **textual** form, entertainment, pleasure and patterns of media consumption (computer games, simulations, special effects cinema).
- **New ways of representing the world:** media which, in ways that are not always clearly defined, offer new representational possibilities and experiences (immersive virtual environments, screen-based interactive multimedia).
- **New relationships between subjects (users and consumers) and media technologies:** changes in the use and reception of image and communication media in everyday life and in the meanings that are invested in media technologies (3.1–3.10 and 4.3).

- ***New experiences of the relationship between embodiment, identity and community***: shifts in the personal and social experience of time, space, and place (on both local and global scales) which have implications for the ways in which we experience ourselves and our place in the world.
- ***New conceptions of the biological body's relationship to technological media***: challenges to received distinctions between the human and the artificial, nature and technology, body and (media as) technological prostheses, the real and the **virtual** (5.1 and 5.4).
- ***New patterns of organisation and production***: wider realignments and integrations in media culture, industry, economy, access, ownership, control and regulation (3.5–3.22).

If we were to set out to investigate any one of the above, we would quickly find ourselves encountering a whole array of rapidly developing fields of technologically mediated production (user-generated content) and even a history of such as the site for our research. These would include:

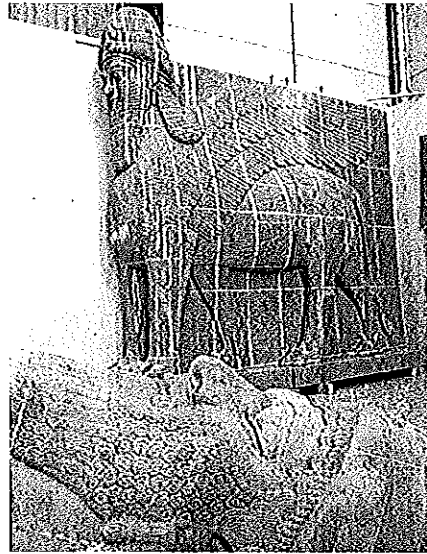
- ***Computer-mediated communications***: email, chat rooms, avatar-based communication forums, voice image transmissions, the World Wide Web, blogs etc., social networking sites, and mobile telephony.
- ***New ways of distributing and consuming*** media texts characterised by interactivity and hypertextual formats – the World Wide Web, CD, DVD, Podcasts and the various platforms for computer games.
- ***Virtual 'realities'***: simulated environments and immersive representational spaces.
- ***A whole range of transformations and dislocations of established media*** (in, for example, photography, animation, television, journalism, film and cinema).

1.2 The characteristics of new media: some defining concepts

In 1.1 we noted that the unifying term 'new media' actually refers to a wide range of changes in media production, distribution and use. These are changes that are technological, textual, conventional and cultural. Bearing this in mind, we nevertheless recognise that since the mid-1980s at least (and with some changes over the period) a number of concepts have come to the fore which offer to define the key characteristics of the field of new media as a whole. We consider these here as some of the main terms in discourses about new media. These are: **digital, interactive, hypertextual, virtual, networked, and simulated**.

Before we proceed with this, we should note some important methodological points that arise when we define the characteristics of a medium or a media technology. What we are calling 'characteristics' here (digital, interactive, hypertextual etc.) can easily be taken to mean the 'essential qualities' of the medium or technology in question. When this happens being 'digital', for example, ceases to mean a source of possibilities, to be used, directed, and exploited. It becomes, instead, a totalising or overarching concept which wholly subsumes the medium in question. There is then a danger that we end up saying, 'Because a technology is like "this" (electronic, composed of circuits and pulses which transform colour, sound, mass or volume into binary digital code) it *necessarily* results in "that" (networked, fleeting and immaterial products)'. To make this move risks the accusation of 'essentialism' (an 'essentialist' being someone who argues that a thing is what it is because it possesses an unchanging and separable essence: see 5.4.6).

(Bruno Latour,
'Alternative digitality'
at: http://www.bruno-latour.fr/presse/presse_art/GB-05%20DOMUS%2005-04.html)



1.1 One of the complete human-headed lions from the entrance to the throneroom of Ashurnasirpal II now in the British Museum. The head of a corresponding sculpture can be seen in the foreground. These two figures were recorded using a NUB 3D Triple White light scanning system. They were recorded and milled at a resolution of 400 microns. Photograph by Factum Arte

With regard to 'digitality' an instructive example is offered by the work carried out by the artists and technicians of 'Factum-Arte', a group who use digital technology to reproduce ancient artefacts such as sculptures, monuments, bas-reliefs and paintings (<http://www.factum-arte.com/eng/default.asp>). These are not virtual, screen based replicas of the original works but material facsimiles ('stunning second originals') achieved by computers and digital technology driving and guiding powerful 3-D scanners, printers and drills. Here, the 'digital' produces hefty material objects rather than networked, fleeting and immaterial things (see **Figs 1.1** and **1.2**). This may be a rare case of digital technology being directly connected to the production of physically massive artefacts rather than flickering images on screens (the 'virtual') but it nevertheless warns against the kind of 'this therefore that' (digital) essentialism we warned of above.

On the other hand, while traditional media studies is wary of doing so (see **1.6–1.6.5**, **4.3.4**, and **5.1–5.1.10**), in **5.4.6** we also argue that it is very important to pay attention to the physical and material constitution of a technology (a digital media-technology no less than a heavy industrial manufacturing technology), not just its cultural meanings and social applications. This is because there is a real sense in which the physical nature and constitution of a technology encourages and constrains its uses and operation. To put this very basically, some technologies are tiny things, some are large and hefty. In terms of media technologies, compare an iPod to a 1980s 'ghetto-blaster' (**Fig 1.3**), or a 1940s 'radiogram' (**Fig 1.4**) and consider the influence that their sheer size has on how they are used, where and by whom, quite apart from matters such as the lifestyles and cultural meanings that may be attached to these objects.

Such physical properties of technologies are real. They change the environments and ecologies, natural and social, in which they exist. They seriously constrain the range of purposes to which they can be put and powerfully encourage others. Hence, recognising what a technology is – really and physically – is a crucial, if a partial and qualified aspect of a media technology's definition. This does not mean that we should reduce technology to its physical features because in doing that we would become essentialist about technological objects; we would arrive at a technological essentialism.

Let us take a final example from 'old' media: broadcast television (or radio). It is common



1.2 The feet of one of the human-headed lions from the entrance to the throneroom of Ashurnasirpal II now in the British Museum. The 3-dimensional data was recorded using a NUB 3D Triple White light scanning system and milled at a resolution of 400 microns. On the computer screen is an image of the scanned data which is directly compared to the facsimile to ensure accuracy. Photograph by Factum Arte



1.3 1980s ghetto-blaster. © Stone/Getty Images



1.4 1940s radiogram. England, 1940, WWII forces sweetheart, singer Vera Lynn places a record on her radiogram. Photo © Popperfoto/Getty Images

The question of determination (technological or other) is a more complex question, and is dealt with in 1.6.6 and 5.2

(especially when contrasted to digital networked media) to think of television as a centralised medium – broadcasting out from a centre to a mass audience. This is not because the technology of television inevitably leads to centralisation (just as Factum-Arte's digitality doesn't inevitably lead to virtuality) but it does lend itself to such a use; it readily facilitates centralisation. Of course, alternative uses of broadcast media existed as in 'ham' and CB radio, in local television initiatives in many parts of the world, or even the use of the television receiver as a sculptural light-emitting object in the video installations of the artist Nam June Paik. Nevertheless television came to be developed and put to use dominantly in a centralising direction. That is, television came to be organised in this way within a social structure which needed to communicate from centres of power to the periphery (the viewer/listener). Recognising that a single media technology can be put to a multiplicity of uses, some becoming dominant and others marginal for reasons that can be cultural, social, economic or political as well as technological, is one important way of understanding what a medium is (1.6).

So, our approach here, in identifying new media's 'characteristics', is not meant to lead to or endorse essentialism but to take seriously the physical constitution and operation of technologies as well as the directions in which they have been developed. Being 'digital' is a real state and it has effects and potentialities. On the other hand, this does not mean that 'being digital' is a full description or wholly adequate concept of something. There is, then, a difference between assuming or asserting that we have detected the essence of something and recognising the opportunities or constraints that the nature of a media technology places before us. A useful term here, taken from design theory, is 'affordance' which refers to

the perceived and actual properties of (a) thing, primarily those fundamental properties that determine just how the thing could possibly be used . . . A chair affords ('is for') support, and, therefore, affords sitting. A chair can also be carried. Glass is for seeing through, and for breaking.

(Norman 2002: 9).

'Affordance' draws our attention to the actions that the nature of a thing 'invites' us to perform. It is in this spirit that we now discuss the defining characteristics of new media.

1.2.1 Digital

We need first of all to think about why new media are described as digital in the first place – what does 'digital' actually mean in this context? In addressing this question we will have cause to define digital media against a very long history of analogue media. This will bring us to a second question. What does the shift from analogue to digital signify for producers, audiences and theorists of new media?

In a digital media process all input data are converted into numbers. In terms of communication and representational media this 'data' usually takes the form of qualities such as light or sound or represented space which have already been coded into a 'cultural form' (actually 'analogues'), such as written text, graphs and diagrams, photographs, recorded moving images, etc. These are then processed and stored as numbers and can be output in that form from **online** sources, digital disks, or memory drives to be decoded and received as screen displays, dispatched again through telecommunications networks, or output as 'hard copy'. This is in marked contrast to analogue media where all input data is converted into another physical object. 'Analogue' refers to the way that the input data (reflected light from a textured surface, the live sound of someone singing, the inscribed marks of someone's

handwriting) and the coded media product (the grooves on a vinyl disc or the distribution of magnetic particles on a tape) stand in an analogous relation to one another.

Analogues

'Analogue' refers to processes in which one set of physical properties can be stored in another 'analogous' physical form. The latter is then subjected to technological and cultural coding that allows the original properties to be, as it were, reconstituted for the audience. They use their skills at e.g. watching movies to 'see' the 'reality' through the analogues. *Analogos* was the Greek term which described an equality of ratio or proportion in mathematics, a transferable similarity that by linguistic extension comes to mean a comparable arrangement of parts, a similar ratio or pattern, available to a reader through a series of transcriptions. Each of these transcriptions involves the creation of a new object that is determined by the laws of physics and chemistry.

CASE STUDY 1.1: Analogue and digital type

Consider how this book would have been produced by the analogue print process which used discrete, movable pieces of metal type; the way of producing books in the 500 years between Gutenberg's mid fifteenth-century invention of the printing press and the effective introduction of digital printing methods in the 1980s. Handwritten or typed notes would have been transcribed by a typesetter who would have set the pages up using lead type to design the page. This type would then have been used with ink to make a physical imprint of the words onto a second artefact – the book proofs. After correction these would have been transcribed once more by the printer to make a second layout, which would again have been made into a photographic plate that the presses would have used to print the page. Between the notebook and the printed page there would have been several analogous stages before you could read the original notes. If, on the other hand, we write direct into word processing software every letter is immediately represented by a numerical value as an electronic response to touching a key on the keyboard rather than being a direct mechanical impression in paper caused by the weight and shape of a typewriter 'hammer' (see Hayles 1999: 26, 31). Layout, design and correction can all be carried out within a digital domain without recourse to the painstaking physical work of type manipulation.

Analogue media, mass production and broadcasting

The major media of the nineteenth and early twentieth centuries (prints, photographs, films and newspapers) were the products not only of analogue processes but also of technologies of mass production. For this reason, these traditional mass media took the form of industrially mass-produced physical artefacts which circulated the world as copies and commodities.

With the development of broadcast media, the distribution and circulation of such media as physical objects began to diminish. In broadcast media the physical analogue properties of image and sound media are converted into further analogues. These are wave forms of differing lengths and intensities which are encoded as the variable voltage of transmission signals. In live broadcast media such as pre-video television or radio there was a direct conversion of events and scenes into such electronic analogues.

This electronic conversion and transmission (broadcast) of media like film, which is a physical analogue, suggests that digital media technologies do not represent a complete break with traditional analogue media. Rather, they can be seen as a continuation and extension of a principle or technique that was already in place; that is to say, the principle of conversion from physical artefact to signal. However, the scale and nature of this extension are so significant that we might well experience it not as a continuation but as a complete break. We now look at why this is so.

For a detailed discussion of the differences between analogue and digital processes see T. Binkley, 'Reconfiguring culture' in P. Hayward and T. Wollen, *Future Visions: new technologies of the screen*, London: BFI (1993)

Digital media

In a digital media process the physical properties of the input data, light and sound waves, are not converted into another object but into numbers; that is, into abstract symbols rather than analogous objects and physical surfaces. Hence, media processes are brought into the symbolic realm of mathematics rather than physics or chemistry. Once coded numerically, the input data in a digital media production can immediately be subjected to the mathematical processes of addition, subtraction, multiplication and division through **algorithms** contained within software.

It is often mistakenly assumed that 'digital' means the conversion of physical data into binary information. In fact, digital merely signifies the assignment of numerical values to phenomena. The numerical values could be in the decimal (0–9) system; each component in the system would then have to recognise ten values or states (0–9). If, however, these numerical values are converted to binary numbers (0 and 1) then each component only has to recognise two states, on or off, current or no current, zero or one. Hence all input values are converted to binary numbers because it makes the design and use of the pulse recognition components that are the computer so much easier and cheaper.

This principle of converting all data into enormous strings of on/off pulses itself has a history. It is traced by some commentators from the late seventeenth-century philosopher Leibniz, through the nineteenth-century mathematician and inventor, Charles Babbage, to be formulated seminally by Alan Turing in the late 1930s (Mayer 1999: 4–21). The principle of binary digitality was long foreseen and sought out for a variety of different reasons. However, without the rapid developments in electronic engineering begun during the Second World War it would have remained a mathematical principle – an idea. Once the twin engineering goals of miniaturisation and data compression had combined with the principle of encoding data in a digital form massive amounts of data could be stored and manipulated.

In the last decades of the twentieth century the digital encoding of data moved out from the laboratories of scientific, military and corporate establishments (during the mainframe years) to be applied to communications and entertainment media. As specialist software, accessible machines and memory-intensive hardware became available, first text and then sound, graphics and images became encodable. The process swiftly spread throughout the analogue domain, allowing the conversion of analogue media texts to digital bit streams.

The principle and practice of digitisation is important since it allows us to understand how the multiple operations involved in the production of media texts are released from existing only in the material realm of physics, chemistry and engineering and shift into a symbolic computational realm. The fundamental consequences of this shift are that:

- media texts are 'dematerialised' in the sense that they are separated from their physical form as photographic print, book, roll of film, etc. (However see the section 'Digital processes and the material world' for an account of why this does not mean that digital media are 'immaterial'.)
- data can be compressed into very small spaces;
- it can be accessed at very high speeds and in non-linear ways;
- it can be manipulated far more easily than analogue forms.

The scale of this quantitative shift in data storage, access and manipulation is such that it has been experienced as a qualitative change in the production, form, reception and use of media.

See W. J. Mitchell, *The Reconfigured Eye*, Cambridge, Mass.: MIT Press (1992), pp. 1–7, 18–19, and footnote on p. 231

Fixity and flux

Analogue media tend towards being fixed, where digital media tend towards a permanent state of flux. Analogue media exist as fixed physical objects in the world, their production being dependent upon transcriptions from one physical state to another. Digital media may exist as analogue hard copy, but when the content of an image or text is in digital form it is available as a mutable string of binary numbers stored in a computer's memory.

The essential creative process of editing is primarily associated with film and video production, but in some form it is a part of most media processes. Photographers edit contact strips, music producers edit 'tapes'; and of course written texts of all kinds are edited. We can use the process of editing to think further about the implications of 'digitality' for media.

To change or edit a piece of analogue media involved having to deal with the entire physical object. For instance, imagine we wanted to change the levels of red on a piece of film as an analogue process. This would involve having to 'strike' new prints from the negative in which the chemical relationship between the film stock and the developing fluid was changed. This would entail remaking the entire print. If the original and inadequate print is stored digitally every pixel in every frame has its own data address. This enables us to isolate only the precise shots and even the parts of the frame that need to be changed, and issue instructions to these addresses to intensify or tone down the level of red. The film as a digital document exists near to a state of permanent flux until the final distribution print is struck and it returns to the analogue world of cinematic exhibition. (This too is changing as films get played out from servers rather than projectors in both on-demand digital TV and movie theatres.)

Any part of a text can be given its own data address that renders it susceptible to interactive input and change via software. This state of permanent flux is further maintained if the text in question never has to exist as hard copy, if it is located only in computer memories and accessible via the Internet or the web. Texts of this kind exist in a permanent state of flux in that, freed from authorial and physical limitation, any net user can interact with them, turning them into new texts, altering their circulation and distribution, editing them and sending them, and so on. This fundamental condition of digitality is well summarised by Pierre Lévy:

The established differences between author and reader, performer and spectator, creator and interpreter become blurred and give way to a reading writing continuum that extends from the designers of the technology and networks to the final recipient, each one contributing to the activity of the other -- the disappearance of the signature.

(Lévy 1997: 366)

Digital processes and the material world

So digitisation creates the conditions for inputting very high quantities of data, very fast access to that data and very high rates of change of that data. However, we would not want to argue that this represents a complete transcendence of the physical world, as much digital rhetoric does. The limits of the physical sciences' ability to miniaturise the silicon chip may have already have been reached although current research on nano-circuits promises to reduce their current size by many times.

Although wireless connections between computers and servers and to networks are becoming increasingly common, many connections continue to rely upon cables and telephone lines, which have to be physically dug into the earth. On a more day-to-day level the constant negotiations that any computer-based media producer has to make between memory and compression are also testament to the continuing interface with the physical

For news on nano-chip developments see:
<http://www.sciencedaily.com/releases/2006/07/060708082927.htm>

CASE STUDY 1.2: Email: the problem of the digital letter

One estimate suggests that there are now over 1.2 billion, and rising, email users in the world (see: <http://www.radicati.com/>). For those of us within that sixth of the world's population email is now an everyday medium; part of the everyday routines which have dropped below the level of conscious attention. Yet 'e-mail' (electronic mail) developed alongside or within the wider development of the Internet from its origins in more local networks such as ARPANET from the 1970s on. In this sense it was simply a way of writing terse notes or messages in much the same way as people wrote and sent notes or letters to one another with the advantage of much more rapid delivery. However, as the ownership of networked PCs grew, and email applications became widely available, commercially or as free downloads, the email came to replace the written letter for very large numbers of people. There is more to this than meets the eye (not least for the postal services that still exist worldwide) and it continues to be a useful case study in thinking about the significance of digitality.

The conventional letter had specific and valuable characteristics and an important history (and for some people, it still has. Indeed, some of the characteristics of email communication that we discuss below have led to a certain re-evaluation of the 'letter'). The letter requires physical production, it has to be written or typed, put into an envelope, licked, posted in a special box. It is then subject to the vast enterprise of the post office system in which each house is a physicalised data address.

In addition to these material properties the letter has an important history as a literary and cultural form. Until industrialisation interpersonal communication over distance by writing depended upon the physical transportation of the text by messenger, hand to hand. Public or private news took days or weeks to move from one part of a country, or empire, to another. This pace of transmission had an effect upon the status of the message: the arrival of a letter in pre-industrial society was an 'occasion', replete with significance.

The commercial and military imperatives of industrialisation and imperialism demanded greater speed and accuracy in person-to-person communications, leading to developments in telegraphy, telephony and the modern postal service. By contrast, we might characterise email in relation to the principles of digitality (i.e. speed, quantity and flexibility). The email process, though not instantaneous, is extremely fast compared to the physical transportation of a letter; so fast, in fact, that it might stand as one of the best examples of the kind of 'space-time compression' often referred to as typical of a **postmodern** communications environment. Distant locations are brought into the same communicative proximity as the office next door.

Additionally the email, because it exists only in digital not analogue form, is subject to multiple transformations and uses. Unlike the handwritten letter it can be multiply re-edited during composition, and the recipient can re-edit the original, interpolating comment and response. The email can be sent to individuals or groups, so the email might be written in any number of registers on a private-public scale. Writing an email to your co-workers will demand a different mode of address from writing an email to your extended friends and family network. A one-to-one email will have a different tone from a group email - in composing we are constantly negotiating different positions on a private-public scale.

This flexibility is enhanced by the possibility of making attachments to the email. These might be anything from another text document to photos, moving image files or music. More or less whatever can be digitised can be attached. Here we see email exemplifying **convergence** of previously discrete media forms.

These qualities have led to a massive increase in the quantity of communications information processed via the PC. There is a net increase in communicative actions, a perceived increase in productivity for organisations, and arguably an increase in social and familial communicative traffic (among what we have to remember is still a global minority with domestic online access). At the level of administration and management this use of email represents an intensification of the paper-based form of the memo. However, this increase in traffic creates new problems of data storage and management; the sheer volume of email received by organisational workers creates 'information overload'. 'No email days' have become a feature of corporate life as managers have come to understand that constant message checking is the enemy of concentration (see Wakefield 2007).

These changes have a number of qualitative implications. For instance, whereas the postal letter has evolved a whole series of formal codes and conventions in modes of address (inscribed as core topics within British schools' National Curriculum) the new forms of digital text communication have evolved a whole set of far less formal conventions:

Thoughts tend toward the experiential idea, the quip, the global perspective, the interdisciplinary thesis, the uninhibited, often

emotional response. I Way [Internet] thought is modular, non-linear, malleable and co-operative. Many participants prefer internet writing to book writing as it is conversational, frank and communicative rather than precise and over written.

(Kevin Kelly, editor, *Wired* magazine in 'Guardian Online', 20 June 1994)

However, the responses prompted by the instantaneous availability of the reply button are not always so positive – hence the Internet-based practice of 'flaming' – argumentative, hostile and insulting exchanges which can accelerate rapidly in a spiral of mutual recrimination. It is precisely the absence of the face-to-face exchange that leads to communication that can become dangerous. The carefully crafted diplomatically composed memo gives way to the collectively composed, often acrimonious, email debate.

With this kind of history in mind we can see how a consideration of even the banal case of email might give rise to a number of central critical questions:

- 1 Where does control over **authorship** lie when the email text can be multiply amended and forwarded?
- 2 What kind of authority should we accord the electronic letter? Why do we still insist on hard copy for contractual or legal purposes?
- 3 What are the possible consequences of an interpersonal communication system based increasingly not on face-to-face interaction but on anonymous, instant, interaction?

In attempting to answer such questions we might have recourse to different kinds of analytic contexts. First of all an understanding of the cultural history and form of the letter itself. Second, an understanding of the convergence of discrete media forms through the process of digitisation. Third, an attempt to assess those shifts through already existing analyses of culture – in this case theories of authorship and reading. Finally, the questions above would have to be answered with reference to the study of CMC (Computer Mediated Communications) in which the problem of the disappearance of face-to-face communication has been central.

world that has always been at the centre of media processing. For consumers worldwide, differences of wealth and poverty which underpin their highly differential access to other goods, services and technologies apply equally to digital media. The digital principle does not escape the demands of physics or the economic principles of scarcity.

For a brief history of email see: <http://www.livinginternet.com/e/ei.htm>

1.2.2 Interactivity

Since the early 1990s, the term 'interactivity' has been much debated and has undergone frequent redefinition. Most commentators have agreed that it is a concept that requires further definition if it is to have any analytical purchase (see e.g. Downes and McMillan 2000; Jensen 1999; Schultz 2000; Huhtamo 2000; Aarseth 1997; Manovich 2001: 49–61). Subsequently there have been several main attempts to do so which we discuss below and in **Case Study 1.3**. The concept also carries a strong ideological charge: as Aarseth (1997: 48) observed, 'To declare a system interactive is to endorse it with a magic power.'

At the ideological level, interactivity has been one of the key 'value added' characteristics of new media. Where 'old' media offered passive consumption new media offer interactivity. Generally, the term stands for a more powerful sense of user engagement with media texts, a more independent relation to sources of knowledge, individualised media use, and greater user choice. Such ideas about the value of 'interactivity' have clearly drawn upon the popular discourse of neo-liberalism (see 3.7) which treats the user as, above all, a consumer. Neo-liberal societies aim to commodify all kinds of experience and offer more and more finely tuned degrees of choice to the consumer. People are seen as being able to make individualised lifestyle choices from a never-ending array of possibilities offered by the market. This

Case study 1.3 What is new about interactivity?

3.4 Political economy

For full discussions of the problems of defining interactivity see Jens E. Jensen's 'Interactivity – tracking a new concept in media and communication studies', in Paul Mayer (ed.) *Computer Media and Communication*, Oxford: Oxford University Press, (1999), which offers a comprehensive review of theoretical approaches, and E. Downes and S. McMillan, 'Defining Interactivity', *New Media and Society* 2.2 (2000): 157–179 for a qualitative ethnographic account of the difficulties of applying theoretical definitions in practice; and Lisbet Klastrup (2003) *Paradigms of interaction conceptions and misconceptions of the field today* (<http://www.dichtung-digital.com/2003/issue/4/klastrup/>) for a provocative study of the term's slipperiness

1.2.3 Hypertextual

1.2.5 Virtual

2.1–2.6 What happened to Virtual Reality; The virtual and visual culture; The digital virtual; Immersion: a history; Perspective, camera, software; Virtual images/Images of the virtual

ideological context then feeds into the way we think about the idea of interactivity in digital media. It is seen as a method for maximising consumer choice in relation to media texts.

However, in this section we are mainly concerned with the instrumental level of meanings carried by the term 'interactive'. In this context, being interactive signifies the users' (the individual members of the new media 'audience') ability to directly intervene in and change the images and texts that they access. So the audience for new media becomes a 'user' rather than the 'viewer' of visual culture, film and TV or a 'reader' of literature. In interactive multimedia texts there is a sense in which it is necessary for the user to actively intervene; to act as well as viewing or reading in order to produce meaning. This intervention actually subsumes other modes of engagement such as 'playing', 'experimenting', and 'exploring' under the idea of interaction. Hinting at the connection between instrumental definitions and ideological meanings, Rosanne Allucquere Stone suggests that the wide field of possibility suggested by the idea of interactivity has been 'electronically instantiated . . . in a form most suitable for commercial development – the user moves the cursor to the appropriate place and clicks the mouse, which causes something to happen' (Stone 1995: 8). We can break down this pragmatic account of interactivity further.

Hypertextual navigation

Here the user must use the computer apparatus and software to make reading choices in a database. (We are using the term 'database' in a general rather than specifically technical sense – a database is any collection of memory stored information, text, image, sound, etc.) In principle, this database could be anything from the entire World Wide Web to a particular learning package, an adventure game, or the hard drive on your own PC. The end results of such interactions will be that the user constructs for him or herself an individualised text made up from all the segments of text which they call up through their navigation process. The larger the database the greater the chance that each user will experience a unique text (1.2.3).

Immersive navigation

In the early 1990s Peter Lunenfeld (1993) usefully distinguished between two paradigms of interaction, which he called the 'extractive' and the 'immersive'. Hypertextual navigation (above) is 'extractive'. However, when we move from seeking to gain access to data and information to navigating representations of space or simulated 3D worlds we move into 'immersive' interaction. In some sense both kinds of interaction rely upon the same technological fact – the existence of a very large database which the user is called upon to experience. At one level, a more or less realistically rendered 3D space like the game world of 'Halo 3' or 'Grand Theft Auto IV' is just as much a big database as Microsoft's 'Encarta' encyclopaedia. We might say that the navigation of immersive media environments is similar to hypertextual navigation, but with additional qualities (1.2.5, 2.1–2.6).

When interacting in immersive environments the user's goals and the representational qualities of the media text are different. Immersive interaction occurs on a spectrum from 3D worlds represented on single screens through to the 3D spaces and simulations of virtual reality technologies. Although the point-and-click interactivity of hypertextual navigation may well be encountered in such texts, immersive interaction will also include the potential to explore and navigate in visually represented screen spaces. Here the purpose of interaction is likely to be different from the extractive paradigm. Instead of a text-based experience aimed at finding and connecting bits of information, the goals of the immersed user will include the visual and sensory pleasures of spatial exploration.

Registrational interactivity

Registrational interactivity refers to the opportunities that new media texts afford their users to 'write back into' the text; that is to say, to add to the text by registering their own messages. The base line of this kind of interactivity is the simple activity of registration (i.e. sending off details of contact information to a website, answering questions prompted in online transactions, or typing in a credit card number). However, it extends to any opportunity that the user has to input to a text. The original Internet bulletin boards and newsgroups were a good example – not interactive in the sense of face-to-face communication, yet clearly built up by successive inputs of users' comments. This 'input' or 'writing back' then becomes part of the text and may be made available to other users of the database.

Interactive communications

As we have seen in our case study of email (**Case study 1.2**), computer-mediated communications (CMC) have offered unprecedented opportunities for making connections between individuals, within organisations, and between individuals and organisations.

Much of this connectivity will be of the registrational interactivity mode (defined above) where individuals add to, change, or synthesise the texts received from others. However, when email and chat sites are considered from the point of view of human communication, ideas about the degree of reciprocity between participants in an exchange are brought into play. So, from a Communication Studies point of view, degrees of interactivity are further broken down on the basis of the kinds of communication that occur within CMC. Communicative behaviours are classified according to their similarity to, or difference from, face-to-face dialogue, which is frequently taken as the exemplary communicative situation which all forms of 'mediated' communication have to emulate. On this basis, the question and response pattern of a bulletin board or online forum, for instance, would be seen as less interactive than the free-flowing conversation of a chat site. This inflects the whole idea of interactivity by lending it a context of person-to-person connection.

Interactivity and problems of textual interpretation

Interactivity multiplies the traditional problems about how texts are interpreted by their readers. By the problem of interpretation we refer to the idea that the meaning of any given text is not securely encoded for all audiences to decode in the same way. This is based upon the recognition that the meanings of a text will vary according to the nature of its audiences and circumstances of reception. We all already have highly active interpretative relationships with the analogue (or linear) texts we encounter, such as books and movies. Under conditions of interactivity this problem does not disappear but is multiplied exponentially. This is because the producer of an interactive text or navigable database never knows for certain which of the many versions of the text their reader will encounter. For critics this has raised the essential question of how to evaluate or even conceptualise a 'text' that never reads the same way twice. For producers it raises essential problems of control and authorship. How do they make a text for a reader knowing that they have very many possible pathways through it?

What is the interactive text?

Established ways of thinking about how meaning is produced between readers and texts assumed a stability of the text but a fluidity of interpretation. Under conditions of interactivity this traditional stability of the text has also become fluid. Hence as critics we find ourselves having to reconceptualise the status of our own interpretations of the interactive text. From a theoretical point of view the traditional semiotic tools used for analysis of texts become

Case study 1.2 Email: the problem of the digital letter

See Lev Manovich 'What New Media is Not', *The Language of New Media*, Cambridge, Mass.: MIT Press (2001), pp. 49–61 and Espen Aarseth, 'We All Want to Change the World: the ideology of innovation in digital media', *Digital Media Revisited* (eds T. Rasmussen, G. Liestol and A. Morrison), Cambridge, Mass.: MIT Press (2002). Both authors argue that we have always had an 'interactive' relationship with texts of all kinds because of our individual interpretative relationships with them and that therefore 'interactivity' is a redundant term

inadequate. Aarseth observed in his seminal study of the problem in *Cybertext*: '[t]he new [interactive digital media] consist of "interactive dynamic" elements, a fact that renders traditional semiotic models and terminology, which were developed for objects that are mostly static, useless in their present unmodified form' (Aarseth 1997: 26). Instead of the traditional text/user relations the many kinds of interactivity now available have suggested the need to think of the user as a component in cybernetic circuit of machine, text and body:

Cybertext . . . is the wide range (or perspective) of possible textualities seen as a typology of machines, as various kinds of literary communication systems where the functional differences among the mechanical parts play a defining role in determining the aesthetic process . . . cybertext shifts the focus from the traditional threesome of author/sender, text/message, and reader/receiver to the cybernetic intercourse between the various part(icipant)s in the textual machine.

(Aarseth 1997: 22)

Understandings of the role of the body in this circuit have become increasingly frequent following Marie-Laure Ryan's (2001) work calling for a phenomenology that analyses 'the sense of "presence" through which the user feels corporeally connected to the virtual world' (2001: 14). These approaches are particularly appropriate where the interactive pleasures on offer are primarily kinaesthetic rather than cognitive as in the case of the immersive interactions offered by computer games for example. As Dovey and Kennedy (2006: 106) argued, 'The idea of a disembodied spectator/viewer/reader is a fictional subject created by particular ways of conceptualising the relationship between "texts" and "readers". This fiction is founded on the Cartesian model of perception whereby consciousness is seen as separate to and distinct from embodiment.'

The cybernetic quality of interactions afforded by digital textualities has led some commentators (see Aarseth 2001, Eskelinen 2001 and Moulthrop 2004) to adopt the use of the term 'configuration' in preference to 'interaction'. This term carries the double force of its derivation from Actor Network Theory inflected study of technological design (Woolgar 1991) and its more colloquial meaning of the ways in which were all called upon to individually 'configure' or simply 'set up' our own technological environments. In his study of usability trials Woolgar defines configuration as designers' attempts to 'define, enable, and constrain' the user, through the design of an object which will 'define and delimit' the user's possible behaviours. In this sense technologies 'configure' us, affording particular kinds of behavioural patterns. So whereas the term 'interaction' implies a two-way communication, 'configuration' suggests a two-way, mutually constitutive process through which both user and software are dynamically engaged in refashioning one another in a feedback loop. Moulthrop argues that understanding computer gameplay helps to explain how we are all increasingly called upon to have configurative relationships with our media environments:

Games – computer games in particular – appeal because they are configurative, offering the chance to manipulate complex systems within continuous loops of intervention, observation, and response. Interest in such activities grows as more people exchange email, surf the world wide web, post to newsgroups, build web logs, engage in chat and instant messaging, and trade media files through peer-to-peer networks. As in various sorts of gaming, these are all in some degree configurative practices, involving manipulation of dynamic systems that develop in unpredictable or emergent ways.

(Moulthrop 2004: 64)

His argument makes a similar claim to the neo-Frankfurt School position on 'interaction' (see **Case study 1.3**) that 'configuration' is a necessarily active way for us to understand not just software systems but also political and cultural systems:

If we conceive of configuration as a way of engaging not just immediate game elements, but also the game's social and material conditions – and by extension, the conditions of other rule-systems such as work and citizenship – then it may be very important to insist upon the difference between play and interpretation, the better to resist immersion.

(2004: 66)

Problems for producers

If new media products pose new questions about textuality they also demand different relationships between producers and users. How do you design an interface that offers navigational choice but at the same time delivers a coherent experience? These problems will of course vary from one text to another. For instance, a website with many embedded links to other sites will offer users many opportunities to take different pathways. The reader/user is quite likely to click onto another site whilst only halfway through your own. On the other hand, within a downloaded interactive learning package, or one that runs off a discrete memory drive (i.e. CD-ROM/DVD) where there is a finite database, the user can be far more easily 'guided' in their navigation of pathways that the producers are able to pre-structure. This has meant that producers of interactive texts have gradually come to understand that they need to have collaborative and co-creative relationship with their audiences (see **3.22–3.23**). The digital media text (e.g. website, game, social network), is an *environment* supporting a range of user activities that emerge within the perimeters of the software. Producers therefore need, in Woolgar's terms, to 'configure' the user, to have some idea of the kinds of behaviours that they want their environment to afford, whilst simultaneously understanding that they can neither wholly predict nor control what users will do within it.

These rich forms of interaction therefore have a number of consequences for producers:

- they create the possibility for traditional media producers to collaborate with audiences by finding ways to incorporate 'user-generated content' in their corporate projects e.g. newspapers 'crowdsourcing' stories (see **3.21**)
- they also redefine the producer not as author but as 'experience designer'. Authors produced texts that readers interpreted. Interactive media designers are increasingly experience designers, creating open media spaces within which users find their own pathways (e.g. *The Sims* or *Second Life*)
- audiences' expectations of an interactive experience with a mediated world create the conditions for transmedial production in which for instance a TV programme can be repurposed across a range of platforms, a website with chat/forum capability, a box set DVD with additional material, a computer game etc.

1.2.3 Hypertextual

There are clear links between the navigational, explorative, and configurative aspects of interactivity and hypertextuality. Also, like interactivity, hypertextuality has ideological overtones and is another key term that has been used to mark off the novelty of new media from analogue media. Apart from its reference to non-sequential connections between all kinds of data

facilitated by the computer, in the early 1990s the pursuit of literary hypertexts as novels and forms of non-linear fiction was much in evidence, becoming something of an artistic movement. Such literary hypertexts also attracted much attention from critics and theorists. This work now looks something like a transitional moment produced by the meeting between literary studies and new media potential. However, hypertext and hypertextuality remain an important part of the history of computing, particularly in the way they address ideas about the relationship of computer operating systems, software and databases, to the operation of the human mind, cognitive processes and learning.

Histories

The prefix 'hyper' is derived from the Greek 'above, beyond, or outside'. Hence, hypertext has come to describe a text which provides a network of links to other texts that are 'outside, above and beyond' itself. Hypertext, both as a practice and an object of study, has a dual history.

One history ties the term into academic literary and representational theory. Here there has long been an interest in the way any particular literary work (or image) draws upon or refers out to the content of others, the process referred to as intertextuality. This places any text as comprehensible only within a web of association that is at once 'above, beyond or outside' the text itself. At another level, the conventional means of footnoting, indexing, and providing glossaries and bibliographies – in other words the navigational apparatus of the book – can be seen as antecedents of hypertexts, again guiding the reader beyond the immediate text to necessary contextualising information.

The other history is derived from the language of the computer development industry. Here, any verbal, visual or audio data that has, within itself, links to other data might be referred to as a hypertext. In this sense the strict term 'hypertext' frequently becomes confused with the idea and rhetoric of hypermedia (with its connotations of a kind of super medium which is 'above, beyond, or outside' all other media connecting them all together in a web of convergence).

Defining hypertexts

We may define a hypertext as a work which is made up from discrete units of material, each of which carries a number of pathways to other units. The work is a web of connection which the user explores using the navigational aids of the interface design. Each discrete 'node' in the web has a number of entrances and exits or links.

As we have seen (1.2.1), in a digitally encoded text any part can be accessed as easily as any other so that we can say that every part of the text can be equidistant from the reader. In an analogue system like traditional video, arriving at a particular frame ten minutes into a tape involved having to spool past every intervening frame. When this information came to be stored digitally this access became more or less instantaneous. Such technology offers the idea that any data location might have a number of instantly accessible links to other locations built into it. Equally the many interventions and manipulations enabled by this facility create the qualities of interactivity (1.2.2).

Hypertext and a model of the mind

Vannevar Bush's 1945 essay 'As We May Think' is often seen as a seminal contribution to the idea of hypertext. Bush was motivated by the problem of information overload; the problem of the sheer volume of knowledge that specialists, even in the late 1940s, had to access and manipulate. Bush proposed that science and technology might be applied to the

It [the Memex] affords an immediate step . . . to associative indexing, the basic idea of which is a provision whereby any item may be caused at will to select immediately and automatically another . . . The process of tying two items together is the important thing.
(Bush in Mayer 1999: 34)

See Pierre Lévy, *Collective Intelligence: Mankind's Emerging World in Cyberspace*, Cambridge: Perseus (1997) and D. Tapscott and A. Williams, *Wikinomics: How Mass Collaboration Changes Everything*, London: Penguin Books (2006) for the ways in which these utopian aspirations have been absorbed into business practice

Bush's argument from 1945 carries within it many of the important ideas that have subsequently informed the technology and practice of hypertext. In particular his position rests upon the assertion that associative linkage of data is a more 'natural' model of information management than the conventional linear alphabetical methods of bibliography such as the Dewey library system. Associative linkage, argues Bush, replicates more accurately the way the mind works. The continuing appeal of hypertext as both information storage and creative methodology has been that it appears to offer a better model of consciousness than linear storage systems. We can observe this appeal continuing in speculation about the development of a global 'neural net' that follows on from Nelson's arguments below. These ideas also resurface in a different form in the arguments of Pierre Lévy calling for a global 'collective intelligence' and in the daily practice of using a site like Wikipedia. Such an enterprise appears in many ways to conform to the idea that knowledge can be produced through associative rather than linear linkage and that, moreover, this knowledge can be collectively authored.

Hypertext as non-sequential writing

The microfiche technologies of the postwar period were unable to create Bush's vision. However, twenty years later, as digital computing began to be more widespread, his ideas were revived, most notably by Ted Nelson. His 1982 paper 'A New Home for the Mind' argues for the wholesale reorganisation of knowledge along hypertextual lines:

This simple facility – call it the jump-link capability – leads immediately to all sorts of new text forms: for scholarship, for teaching, for fiction, for poetry . . . The link facility gives us much more than the attachment of mere odds and ends. It permits fully non sequential writing. Writings have been sequential because pages have been sequential. What is the alternative? Why hypertext – non sequential writing.

(Nelson 1982, in Mayer 1999: 121)

However, Nelson does not stop at the idea of non-sequential writing, he also foresees, ten years before browser software made Internet navigation a non-specialist activity, a medium very close to contemporary website forms of the Internet. In this medium 'documents window and link freely to one another', 'every quotation may be traced instantly', and 'minority interpretations and commentary may be found everywhere'. He envisages

a hyperworld – a new realm of published text and graphics, all available instantly; a grand library that anybody can store anything in – and get a royalty for – with links, alternate visions, and backtrack available as options to anyone who wishes to publish them.

(Nelson 1982, in Mayer 1999: 124)

So, the postwar challenge of managing information overload, a model of the mind as a web of trails and associations, and a concept of non-linear writing then extended to a freely accessible 'grand library' of all kinds of media, finally lead us to the concept of hypermedia. Nelson's vision of the potential of hypertext opens out to encompass an emancipatory configuration of human knowledge based in accessibility and manipulation through associative links.

Hypermediacy

More recently the very specific application of hypertext as an information management principle expanded to suggest all kinds of non-linear, networked paradigms. Here the term began to overlap with the idea of hypermediacy. The ideological investment in the idea of hypertext spills over into use of the term 'hypermedia' to describe the effects of hypertextual methods of organisation on all mediated forms. By the end of the 1990s, hypermediacy emerged as an important term in a theory of new media:

the logic of hypermediacy acknowledges multiple acts of representation and makes them visible. Where immediacy suggests a unified visual space, contemporary hypermediacy offers a heterogeneous space, in which representation is conceived of not as a window on the world, but rather as 'windowed' itself – with windows that open on to other representations or other media. The logic of hypermediacy multiplies the signs of mediation and in this way tries to reproduce the rich sensorium of human experience.

(Bolter and Grusin 1999: 33–34)

Reproducing the 'rich sensorium of human experience' is the kind of claim that recalls Marshall McLuhan's view that media should be understood as extensions of the human body (1.6.2). As we have seen, it is a claim that that was present in the original formulations of ideas of hypertextuality – the assumptions about cognition in Vannevar Bush and Ted Nelson here become a principle in which hypermedia are valorised as somehow representing the ultimate augmentation of human consciousness.

1.6.2 Mapping Marshall
McLuhan

From the library to Google – critical questions in hypertext

Much of the debate arising from the application of hypertext overlapped with discussions about the consequences of interactivity. However, debates about the issues and questions arising from hypertext practices have been conducted with reference to literary theory while questions of interactivity tended to reference human computer interface studies and communication studies.

Clearly, considerations of interactivity and hypertext share a concern with the status and nature of the text itself. What happens when conventional ways of thinking about the text derived from literature or media studies are applied to texts that, allegedly, work in entirely new ways? If the existing structures of knowledge are built upon the book, what happens when the book is replaced by the computer memory and hypertextual linking?

Since the Middle Ages human knowledge and culture has been written, recorded and in some sense produced by the form of the book (see, for example, Ong 2002; Chartier 1994). The printed word has established an entire taxonomy and classification system for the management and production of knowledge (e.g. contents, indices, reference systems, library systems, citation methods, etc.). It is argued that this literary apparatus of knowledge is defined around sequential reading and writing. When we write, we order our material into a linear sequence in which one item leads into another within recognised rhetorical terms of, for example, argument, narrative or observation. Similarly the reader follows, by and large, the sequencing established by the author. Now, it was argued, hypertext offered the possibility of non-sequential reading and writing. There is no single order in which a text must be encountered.

Each 'node' of text carries within it variable numbers of links that take the reader to different successive nodes, and so on. Thus the reader is offered a 'non-linear' or, perhaps more accurately, a 'multilinear' experience. (Following a link is a linear process; however the variable number of links on offer in any given text produce high numbers of possible pathways.)

Knowledge constructed as multilinear rather than monolinear, it is argued, threatens to overturn the organisation and management of knowledge as we have known it to date, since all existing knowledge systems are founded upon the principle of monolinearity.

Thus the very status of the text itself is challenged. The book which you hold in your hand is dissolved into a network of association – within the book itself numerous crosslinkages are made available which facilitate many different reading pathways; and the book itself becomes permeable to other texts. Its references and citations can be made instantly available, and other related arguments or converse viewpoints made available for immediate comparison. In short, the integrity of the book and of book-based knowledge systems is superseded by network knowledge systems. The superstructure of knowledge storage that formed library systems (Dewey classification, indices, paper based catalogues) is replaced by the design of the search engine with its associated systems of metadata, tagging and user-generated taxonomies of knowledge.

The primary literature and debates arising are by now extensive, and have become one of the most important points of contact between European critical theory and American **cyberculture** studies. This section offers a brief introductory overview of the key questions. For further study see, for example, Jay David Bolter, *Writing Space: The Computer, Hypertext and the History of Writing*, New York: Erlbaum (1991); George Landow and Paul Delaney (eds), *Hypermedia and Literary Studies*, Cambridge, Mass.: MIT Press (1991); George Landow, *Hypertext: The Convergence of Contemporary Literary Theory and Technology*, Baltimore and London: Johns Hopkins University Press (1992) (especially pp. 1–34); George Landow (ed.) *Hyper/Text/Theory*, Baltimore and London: Johns Hopkins University Press (1994); Mark Poster, *The Mode of Information*, Cambridge: Polity Press (1990), pp. 99–128

Hypertext scholarship

We can identify two trajectories in the first wave of hypertext scholarship that began to try and understand the significance of these developments.

The first was the return to previously marginal works in the history of literature which had themselves sought to challenge the linearity of text – these often experimental works are then constructed as ‘proto-hypertexts’. So, for instance, works as diverse as the I Ching, Sterne’s *Tristram Shandy*, Joyce’s *Ulysses*, stories by Borges, Calvino, and Robert Coover and literary experiments with the material form of the book by Raymond Queneau and Marc Saporta are all cited as evidence that hypertextual modes of apprehension and composition have always existed as a limit point and challenge to ‘conventional’ literature. For students of other media we might begin to add the montage cinema of Vertov and Eisenstein, experiments with point of view in films like Kurosawa’s *Rashomon* and time in a film like *Groundhog Day* (see, for example, Aarseth 1997: 41–54 and Murray 1997: 27–64). Equally, the montage of Dada, Surrealism and their echoes in the contemporary collage of screen-based visual culture might also be seen as ‘hypermediated’ in Bolter and Grusin’s sense. Here then is another important point at which the history of culture is reformulated by the development of new media forms (1.4).

1.2.4 Networked

During the late 1970s and throughout the 1980s, capitalist economies experienced recurring crises, caused by the rigidity of their centralised production systems. These were crises in the profitability of the mass production of homogeneous commodities for mass consumer markets. In his detailed analysis of a shift from the ‘modern’ to the ‘postmodern’ mode of production, the Marxist cultural geographer David Harvey traced the manner in which these rigidities of centralised ‘fordist’ economies were addressed. Writing in 1989, he noted,

what is most interesting about about the current situation is the way that capitalism is becoming ever more tightly organized *through dispersal*, geographical mobility, and flexible responses in labour markets, labour processes and consumer markets, all accompanied by hefty doses of institutional, product, *and technological innovation* [our emphases]

(Harvey 1989: 159)

These changes were felt in the organisation of media production. In 1985, Françoise Sabbah observed the tendency of the then emerging 'new media' toward decentralisation of production, differentiation of products, and segmentation of consumption or reception:

the new media determine a segmented, differentiated audience that, although massive in terms of numbers, is no longer a mass audience in terms of simultaneity and uniformity of the message it receives. The new media are no longer mass media . . . sending a limited number of messages to a homogeneous mass audience. Because of the multiplicity of messages and sources, the audience itself becomes more selective. The targeted audience tends to choose its messages, so deepening its segmentation . . .

(Sabbah 1985: 219; quoted in Castells 1996: 339)

Now, in the first decade of the twenty-first century, these have become key aspects of our networked and dispersed mediasphere. Over the last twenty-five years or so, the development of decentralised networks has transformed media and communication processes. Indeed, some commentators now argue, we have recently entered a new phase in which these characteristics become even more pronounced. Here, not only are the markets and audiences for media of all kinds de-massified, increasingly specialist and segmented, and involving a blurring of producer and consumer, but whole sectors of the new media industries are learning to see their role as providing the means and opportunities for 'users' to generate their own content. Simultaneously, a new media economics is being recognised, one that does not aim to address large single audiences but instead seeks out the myriad of minority interests and niche markets that the net is able to support (see 3.13, The Long Tail).

The World Wide Web, corporate intranets, Virtual Learning Environments, MPORPGs, 'persistent worlds', Social Network Sites, blog networks, online forums of all kinds, and humble email distribution lists, are all networks of various scales and complexities that nestle within or weave their way selectively through others. All are ultimately connected in a vast, dense and (almost) global network (the Internet itself) within which an individual may roam, if policed and limited by firewalls, passwords, access rights, available bandwidths and the efficiency of their equipment. This is a network that is no longer necessarily accessed at fixed desktop workstations plugged into terrestrial phone lines or cables, but also wirelessly and on the move, via laptops, PDAs, GPS devices, and mobile phones.

There are intricacies, unforeseen contradictions and social, political, economic and cultural questions that arise with these developments. These issues are more fully discussed in Part 3 of this book. For the moment our task is to see how, in recent history, there has been a shift from media centralisation to dispersal and networking.

Consumption

From our present position we can see that from the 1980s on, our consumption of media texts has been marked by a shift from a limited number of standardised texts, accessed from a few dedicated and fixed positions, to a very large number of highly differentiated texts accessed in multifarious ways. The media audience has fragmented and differentiated as the number of media texts available to us has proliferated. For instance, from an era with a limited number of broadcast TV stations, containing no time-shifting VCRs or DVD players, with very limited use of computers as communication devices and no mobile media at all, we now find ourselves confronted by an unprecedented penetration of media texts into everyday life. 'National' newspapers are produced as geographically specific editions; they can be

For further accounts of the development of an approach to hypertext that goes beyond the post-structuralist paradigm, see especially Aarseth (1997), but also Michael Joyce, *Of Two Minds: hypertext pedagogy and poetics*, Ann Arbor: University of Michigan Press (1995); Stuart Moulthrop, 'Toward a rhetoric of informing texts in hypertext', *Proceedings of the Association for Computing Machinery*, New York (1992), 171-179; M. Rieser and A. Zapp (eds) *New Screen Media: cinema/art/narrative*, London: British Film Institute, 2002; M.-L. Ryan, *Possible Worlds, Artificial Intelligence, and Narrative Theory*, Bloomington and Indianapolis: Indiana University Press, (1991); P. Harrigan and N. Wardrip-Fruin (eds) *First Person, New Media as Story, Performance and Game*, Cambridge, Mass.: MIT Press, (2003.)

interactively accessed, archived online, we can receive 'alerts' to specific contents. Network and terrestrial TV stations are now joined by independent satellite and cable channels. Alongside real-time broadcasts we have TV 'on demand', time shifted, downloaded and interactive. The networked PC in the home offers a vast array of communication and media consumption opportunities; mobile telephony and mobile computing have begun to offer a future in which there are no media free zones, at least in the lives of the populations of the 'developed' world. Technologists are currently conceptualising what a 'pervasive' media environment will be, when all media is available on a variety of wireless platforms and devices.

See e.g.
<http://interactive.usc.edu/research/mobile/>

The 'mass media', which were transformed in this way, were the products of the communication needs of the first half of the twentieth century in the industrialised world and as such they had certain characteristics. They were centralised, content was produced in highly capitalised industrial locations such as newspaper printworks or Hollywood film studios. In broadcast media, press and cinema, distribution was tied to production, film studios owned cinema chains, newspapers owned fleets of distribution vans, the BBC and other national 'broadcasters' owned their own transmission stations and masts. Consumption was characterised by uniformity: cinema audiences all over the world saw the same movie, all readers read the same text in a national newspaper, we all heard the same radio programme. And we did these things at the same scheduled times. Twentieth-century mass media were characterised by standardisation of content, distribution and production process. These tendencies toward centralisation and standardisation in turn reflected and created the possibility for control and regulation of media systems, for professionalisation of communicative and creative processes, for very clear distinctions between consumers and producers, and relatively easy protection of intellectual property.

See Brian Winston, *Media, Technology and Society: a History: from the Telegraph to the Internet*, London and New York: Routledge (1998), pp. 243-275, for a history of broadcast networks.

The centre of a circle

A useful way to conceptualise the difference between centralised and dispersed media distribution systems is to think about the differences between radio and television broadcast *transmissions* and computer media *networks*. The technology at the heart of the original radio and TV broadcast systems is radio wave transmission; here transmission suites required high investment in capital, plant, buildings, masts, etc. Airwave transmission was supplemented by systems of coaxial cable transmission, where massive investments throughout the twentieth century led to the establishment of a global network of cable systems crossing whole continents and oceans. At the core of this technology of transmission there was a central idea, that of transmission from 'one to many': one input signal was relayed to many points of consumption. The radio transmitter, then, works (for social and technological reasons) on a centralised model.

Nodes in a web

In contrast, the computer **server** is the technology at the heart of the dispersed systems of new media. A server, by contrast to a transmission mast, is a multiple input/output device, capable of receiving large amounts of data as input as well as making equally large quantities available for downloading to a PC. The server is a networked device. It has many input connections and many output connections, and exists as a node in a web rather than as the centre of a circle.

A radio transmitter capable of handling broadcast radio and TV signals is an expensive capital investment way beyond the reach of most enterprises or individuals. The server, on the other hand, is relatively cheap, being commonplace in medium or large enterprises of all

kinds. Access to server space is commonly domestically available as part of online subscription packages.

However, this simple opposition between the centralised and the networked prompts questions. Most interestingly, it points up how there is no radical and complete break between 'old' and 'new' media. This is because networked media distribution could not exist without the technological spine provided by existing media routes of transmission, from telephone networks to radio transmission and satellite communications. 'Old' media systems of distribution are not about to disappear, although they become less visible, because they are the essential archaeological infrastructure of new media.

New media networks have been able to reconfigure themselves around this 'old' core to facilitate new kinds of distribution that are not necessarily centrally controlled and directed but are subject to a radically higher degree of audience differentiation and discrimination. Many different users can access many different kinds of media at many different times around the globe using network-based distribution. Consumers and users are increasingly able to customise their own media use to design individualised menus that serve their particular and specific needs.

This market segmentation and fragmentation should not be confused with a general democratisation of the media. As Steemers, Robins and Castells have argued, the multiplication of possible media choices has been accompanied by an intensification of merger activities among media corporations: 'we are not living in a global village, but in customised cottages globally produced and locally distributed' (Castells 1996: 341); (see **3.4–3.10**).

Production

This increased flexibility and informality of our interaction with media texts of all kinds is equally present in the field of media production. Here, too, we have seen the development of production technologies and processes that have challenged the older centralised methods of industrial organisation and mass media production sectors. These changes can be perceived within the professional audiovisual industries as well as within our everyday domestic spheres.

Today, media industries are facing the fact that the conjunction of computer-based communications and existing broadcast technologies has created a wholly new and fluid area of media production. The traditional boundaries and definitions between different media processes are broken down and reconfigured. The specialist craft skills of twentieth-century media production have become more generally dispersed throughout the population as a whole, in the form of a widening baseline of 'computer literacy', information technology skills, and especially the availability of software that increasingly affords the production of 'user-generated content' (see **3.21**).

Across the period, the range of sites for the production of media content has expanded – production has been dispersing itself more thoroughly into the general economy, now frequently dubbed 'the knowledge economy' or the 'information society'. This dispersal of production can also be observed from the perspective of the everyday worlds of work and domesticity. Consider the proximity of media production processes to a twentieth-century citizen. In the UK during the 1970s, for instance, the nineteenth-century media processes of print and photography would probably have been the only kind of media production processes that might be used or discussed in everyday life as part of civic, commercial, cultural or political activity. Broadcasting and publishing systems (the 'press') were mostly very distant from the lives of ordinary people. However, by the end of the century, print production was easier than ever through digitised desktop publishing, and editorial and design technologies were all available in domestic software packages. Photographic production through

An extraordinary but little noticed and eccentric example of this is the use of a subterranean system of conduits designed to provide hydraulically (waterpowered) generated electricity to London households in the 1890s. The conduits were designed to hold water under pressure which powered generators placed at the threshold of each subscribing home. This system, owned until the 1970s by the long defunct 'London Hydraulic Power Company', was purchased by Mercury Telecommunications in 1992. Under Mercury's ownership these conduits originally designed to carry water were used as a means to deliver Internet cable services to those same homes (Gershuny 1992)

See also Jeanette Steemers, 'Broadcasting is dead, long live digital choice', *Convergence* 3.1 (1997) and J. Cornford and K. Robins, 'New media', in J. Stokes and A. Reading (eds) *The Media in Britain*, London: Macmillan (1999)

digital cameras, post-production processes, and distribution through file compression and networks, have transformed domestic photography (see Rubinstein and Sluis 2008). Television production has moved much closer to the viewer in the sense that very many of us 'shoot' digital video which can now be distributed online by, for example, YouTube (see 3.23). There may be limitations to this self production of media images, although new conventions and forms are also emerging to which the once mainstream media respond reflexively, but, as Castells recognised, it has also modified the older 'one way flow' of images and has 'reintegrated life experience and the screen' (1996: 338).

The integration of media process into everyday life is not confined to the domestic sphere. As work has increasingly moved towards service rather than production economies all kinds of non-media workers find themselves called upon to be familiar with various kinds of media production processes from web design to Powerpoint presentation and computer-mediated communication software. Both at home and at work media production processes are far closer to the rhythms of everyday life. While we certainly would not wish to over-emphasise the degree of this proximity by echoing claims of cyber pioneers for the total collapse of the distinction between consumption and production, it is certainly the case that the distance between the elite process of media production and everyday life is smaller now than at any time in the age of mass media.

Consumption meets production

Across a range of media we have seen the development of a market for 'prosumer' technologies; that is, technologies that are aimed at neither the professional nor the (amateur) consumer market but both – technologies that enable the user to be both consumer and producer. This is true in two senses; the purchaser of a £2,000 digital video camera is clearly a consumer (of the camera), and may use it to record home movies, the traditional domain of the hobbyist consumer. However, they may equally use it to record material of a broadcast quality for a Reality TV show, or to produce an activist anti-capitalist video that could have global distribution or pornographic material that could equally go into its own circuit of distribution. Until the 1990s the technological separation between what was acceptable for public distribution and what was 'only' suitable for domestic exhibition was rigid. The breakdown of the professional/amateur category is a matter ultimately of cost. The rigid distinction between professional and amateur technologies defined by engineering quality and cost has now broken down into an almost infinite continuum from the video captured on a mobile phone to the high-definition camera commanding six-figure prices.

The impact of these developments has been most clearly seen in the music industry. Digital technologies have made possible a dispersal and diffusion of music production that has fundamentally changed the nature of the popular music market. The apparatus of analogue music production, orchestral studios, 20-foot sound desks and 2-inch rolls of tape can all now be collapsed into a sampling keyboard, a couple of effects units, and a computer. The bedroom studio was clearly one of the myths of 'making it' in the 1990s; however, it is not without material foundation. The popular success of dance music in all its myriad global forms is in part the consequence of digital technologies making music production more accessible to a wider range of producers than at any time previously.

The PC itself is in many ways the ultimate figure of media 'prosumer' technology. It is a technology of distribution, of consumption, as well as a technology of production. We use it to look at and listen to other people's media products, as well as to produce our own, from ripping CD compilations to editing videotape, mixing music or publishing websites. This overlap between consumption and production is producing a new networked zone of media

exhibition that is neither 'professionalised' mainstream nor amateur hobbyist. Jenkins argues that

it is clear that new media technologies have profoundly altered the relations between media producers and consumers. Both culture jammers and fans have gained greater visibility as they have deployed the web for community building, intellectual exchange, cultural distribution, and media activism. Some sectors of the media industries have embraced active audiences as an extension of their marketing power, have sought greater feedback from their fans, and have incorporated viewer generated content into their design processes. Other sectors have sought to contain or silence the emerging knowledge culture. The new technologies broke down old barriers between media consumption and media production. The old rhetoric of opposition and cooptation assumed a world where consumers had little direct power to shape media content and where there were enormous barriers to entry into the marketplace, whereas the new digital environment expands their power to archive, annotate, appropriate, and recirculate media products.

(Jenkins 2002: see 3.21)

In the media industries the craft bases and apprenticeship systems that maintained quality and protected jobs have broken down more or less completely, so that the question of how anyone becomes 'qualified' to be a media producer is more a matter of creating a track record and portfolio for yourself than following any pre-established routes. This crisis is also reflected in media education. Here, some argue for a pressing need for a new vocationalism aimed at producing graduates skilled in networking and the production of intellectual and creative properties. Others argue that, in the light of the new developments outlined above, media studies should be seen as a central component of a new humanities, in which media interpretation and production are a core skillset for all kinds of professional employment. Yet others argue for a 'Media Studies 2.0' which would break with the traditional media studies emphasis on 'old' broadcasting models and would embrace the new skills and creativity of a 'YouTube' generation (see Gauntlett 2007, Merrin 2008).

In summary, new media are networked in comparison to mass media – networked at the level of consumption where we have seen a multiplication, segmentation and resultant individuation of media use; dispersed at the level of production where we have witnessed the multiplication of the sites for production of media texts and a greater diffusion within the economy as a whole than was previously the case. Finally, new media can be seen as networked rather than mass for the way in which consumers can now more easily extend their participation in media from active interpretation to actual production.

1.2.5 Virtual

Virtual worlds, spaces, objects, environments, realities, selves and identities, abound in discourses about new media. Indeed, in many of their applications, new media technologies produce virtualities. While the term 'virtual' (especially 'virtual reality') is readily and frequently used with respect to our experience of new digital media it is a difficult and complex term. In this section we make some initial sense of the term as a characteristic feature of new media. A fuller discussion and history will be found in Part 2 (2.1–2.6). In terms of new digital media we can identify a number of ways in which the virtual is used.

First, throughout the 1990s, the popular icon of 'virtual reality' was not an image of such

a reality itself but of a person experiencing it and the apparatus that produced it. This is the image of a head-set wearing, crouching and contorted figure perceiving a computer-generated 'world' while their body, augmented by helmets carrying stereoscopic LCD screens, a device that monitors the direction of their gaze, and wired gloves or body suits providing tactile and positioning feedback, moves in physical space.

Equally powerful have been a series of movies, cinematic representations of virtual reality, from the early 1980s onwards, in which the action and narrative takes place in a simulated, computer generated world (*Tron*: 1982, *Videodrome*: 1983, *Lawnmower Man*: 1992, *The Matrix*: 1999, *eXistenZ*: 1999).

The 'virtual reality' experienced by the wearer of the apparatus is produced by **immersion** in an environment constructed with computer graphics and digital video with which the 'user' has some degree of interaction. The movies imagine a condition where human subjects inhabit a virtual world which is mistaken for, or has replaced, a 'real' and physical one.

Second, alongside these immersive and spectacular forms of virtual reality, another influential use of the term refers to the space where participants in forms of online communication feel themselves to be. This is a space famously described as 'where you are when you're talking on the telephone' (Rucker *et al.* 1993: 78). Or, more carefully, as a space which 'comes into being when you are on the phone: not exactly where you happen to be sitting, nor where the other person is, but somewhere in between' (Mirzoeff 1999: 91).

As well as these uses, the 'virtual' is frequently cited as a feature of postmodern cultures and technologically advanced societies in which so many aspects of everyday experience are technologically simulated. This is an argument about the state of media culture, postmodern identity, art, entertainment, consumer and visual culture; a world in which we visit virtual shops and banks, hold virtual meetings, have virtual sex, and where screen-based 3D worlds are explored or navigated by videogame players, technicians, pilots, surgeons etc.

Increasingly we also find the term being used retrospectively. We have already noted the case of the telephone, but also the experience of watching film and television, reading books and texts, or contemplating photographs and paintings are being retrospectively described as virtual realities (see Morse 1998; Helm 1993: 110; Laurel in Coyle 1993: 150; Mirzoeff 1999: 92–99). These retrospective uses of the term can be understood in two ways: either as a case of the emergence of new phenomena casting older ones in a new light (Chesher 1997: 91) or that, once it is looked for, experience of the 'virtual' is found to have a long history (Mirzoeff 1999: 91 and Shields 2003).

As Shields has pointed out (2003: 46) in the digital era the meaning of 'virtual' has changed. Where, in everyday usage, it once meant a state that was 'almost' or 'as good as' reality, it has now come to mean or be synonymous with 'simulated' (see 1.2.6). In this sense, rather than meaning an 'incomplete form of reality' it now suggests an alternative to the real and, maybe, 'better than the real' (46). However, some older meanings of 'virtual' still find echoes in modern usage. One of these is the connection between the virtual and the 'liminal' in an anthropological sense, where the liminal is a borderline or threshold between different states such as the carnivals or coming of age rituals held in traditional societies. Such rituals are usually marked by a period in which the normal social order is suspended for the subject who is passing from one status or position to another. The more recent interest in virtual spaces as spaces of identity performance or places where different roles can be played out appears continuous with older liminal zones (Shields 2003: 12).

The rise of the digital virtual (the virtual as simulation and as an alternative reality) has also

See
<http://www.cyberpunkreview.com/virtual-reality-movies/> for a full list of movies about VR

3.17-3.20
 5.4 Theories of
 cyberculture

For a view which challenges the idea that the Internet is a space, or should be thought of as a space at all, see Chesher (1997: 91)

The experience of acting remotely via robotics on a simulation can more accurately be described as telepresence. While telepresence is often subsumed as a kind of VR, see Ken Goldberg, 'Virtual reality in the age of telepresence', *Convergence* 4.1 (1998) for a fuller discussion of the difference

led to interest in philosophical accounts of the virtual. Here, particularly in the thought of the philosopher Gilles Deleuze, we are urged to see that the virtual is not the opposite of the real but is itself a kind of reality and is properly opposed to what is 'actually' real. This is an important argument as, in a world in which so much is virtual, we are saved from concluding that this is tantamount to living in some kind of un-real and immaterial fantasy world. In networked, technologically intensive societies we increasingly pass between actual and virtual realities; in such societies we deal seamlessly with these differing modes of reality (see 3.20).

There is a common quality to the two kinds of virtual reality with which we started above (that produced by technological immersion and computer generated imagery and that imagined space generated by online communications). This is the way that they give rise to puzzling relationships between new media technologies and our experiences and conceptions of space, of **embodiment** (literally: of having and being conscious of having bodies) and identity (see 4.4). The generic concept which has subsumed both kinds of virtual reality has been 'cyberspace'. It is now arguable that the widespread and deep integration of new technologies into everyday life and work means that the concept of 'cyberspace' (as an other space to 'real' physical space) is losing its force and usefulness. Nevertheless, the promise of a fusion of these two kinds of virtual reality – the sensory plenitude of immersive VR and the connectivity of online communication – has been an important theme in the new media imaginary (see 1.5.2) because, in such a scenario, full sensory immersion would be combined with extreme bodily remoteness.

The middle term, the ground for anticipating such a fusion of the two VRs, is the digital simulation of 'high resolution images of the human body in cyberspace' (see Stone 1994: 85). The empirical grounds for venturing such a claim are seen in the form of virtual actors or synthespians (computer simulations of actors) that appear in cinema, TV, and videogames. However, the computing power and the telecommunications bandwidth necessary to produce, transmit and refresh simulations of human beings and their environments, let alone the programming that would enable them to interact with one another in real time, remains a technological challenge. Instead we find the body digitally represented in a host of different ways. In popular culture for instance we see increasing hybridisation of the human body in performance as real actors create the data for a performance which is finally realised in CGI form through various techniques of motion capture. In the realm of MMORPGs we see the body of the user represented through avatars that are the subject of intense and intricate work by their users.

If we were to understand these digitisations of the body as partial realisations of the fully immersive 3-D Avatar, interesting questions arise. Where does the desire for such developments lie? And, what goals or purposes might attract the financial investment necessary for such technological developments? In thinking about these developments, their desirability and purpose, we have to take into account the **technological imaginary (1.5.2)** which so powerfully shapes thinking about new media of all kinds. We are also reminded of the part played by science fiction in providing us with ideas and images with which to think about cyberspace and the virtual. Writing in the mid-1990s, Stone (1994: 84), suggested that when the first 'virtual reality' environments came online they would be realisations of William Gibson's famous definition of cyberspace, in his novel *Neuromancer*, as a 'consensual hallucination'. The current examples of persistent online worlds such as 'Second Life' or games like *World of Warcraft* mark the current stage of this vision and project.

The way in which media history is more generally recast in the light of present preoccupations is discussed in 1.4, What kind of history?

Related to this interest in virtual reality, a more general quality or mode of existence, 'the virtual', has seen revived interest. The concept has a long history in philosophy and theology (see Pierre Lévy, *Becoming Virtual: Reality in the Digital Age*, New York: Perseus, 1998). See also R. Shields, *The Virtual*, London and New York: Routledge (2003), and 5.4.2

1.5.2 The technological imaginary

See also: 2.1 What happened to Virtual Reality?

William Gibson, in *Neuromancer* (1986: 52), describes cyberspace as 'a consensual hallucination experienced daily by billions of legitimate operators in every nation . . . a graphic representation of data abstracted from the banks of every computer in every human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights receding.' This has become the standard science fictional basis for imagining cyberspace as an architectural (Cartesian) space, in which 'a man may be seen, and perhaps touched as a woman and vice versa – or as anything else. There is talk of renting pre-packaged body forms complete with voice and touch . . . multiple personality as commodity fetish!' (Stone 1994: 85)

This is very clear as regards the functional character of VR, which we discuss in 2.1–2.6 below

1.2.6 Simulated

We saw in the previous section that uses of the concept 'virtual' have, in a digital culture, close relationships with 'simulation'. Simulation is a widely and loosely used concept in the new media literature, but is seldom defined. It often simply takes the place of more established concepts such as 'imitation' or 'representation'. However where the concept is paid more attention, it has a dramatic effect on how we theorise cultural technologies such as VR (2.1–2.6) and cinema (2.7). For the moment, it is important to set out how the term has been used in order to make the concept of simulation, and how we will subsequently use it, clear.

Looser current uses of the term are immediately evident, even in new media studies, where it tends to carry more general connotations of the illusory, the false, the artificial, so that a simulation is cast as an insubstantial or hollow copy of something original or authentic. It is important to invert these assumptions. A simulation is certainly artificial, synthetic and fabricated, but it is not 'false' or 'illusory'. Processes of fabrication, synthesis and artifice are real and all produce new real objects. A videogame world does not necessarily imitate an original space or existing creatures, but it exists. Since not all simulations are imitations, it becomes much easier to see simulations as things, rather than as representations of things. The *content* of simulations may of course (and frequently does) derive from 'representations'. This is what lies at the core of Umberto Eco's analysis of Disneyland for instance: the houses in Disneyland's version of an ideal American Main Street are fakes, deceits, they look something like real houses yet are something quite different (in this case supermarkets or gift shops) (Eco 1986: 43). But noticing a gap between the representational content of a simulation (shops, space invaders) and its architectural or mechanical workings should not lead us to discount and ignore the latter. The simulation exists regardless of whether we are fooled by its content or not. Thus the problem to which simulation draws our attention is not that of the difference between 'simulated' and 'real' content, but rather that of the material and real existence of simulations as part of the furniture of the same real world that has been so thoroughly 'represented' throughout the history of the arts and media. In other words a simulation is real *before* it imitates or represents anything.

For the present, however, as things stand in new media studies, not only is there no agreement that simulation does in fact differ from representation or imitation, but the simple profusion of answers to the question of what simulation really is and how, or if it differs at all from representation or imitation, has led many commentators to give up seeking any specificity to the concept and to concede that

[t]he distinction between simulation and imitation is a difficult and not altogether clear one. Nevertheless, it is vitally important. It lies at the heart of virtual reality.

(Woolley 1992: 44)

Yet if the concept is, as Woolley here notes, 'vitally important', it surely becomes all the more important to seek some clarity. We should then examine the ways in which the term is in use with regard to the analysis of new media. There are three very broad such ways, which we will call Postmodernist, Computer, and Game simulation.

Postmodernist simulation

Here the term is drawn principally from Jean Baudrillard's identification of simulation with hyperreality (Baudrillard 1997). According to Baudrillard, simulacra are signs that cannot be exchanged with 'real' elements outside a given system of other signs, but only with other

signs within it. Crucially, these sign-for-sign exchanges assume the functionality and effectiveness of 'real' objects, which is why Baudrillard calls this regime of signs hyperreal. When, under these conditions, reality is supplanted by hyperreality, any reality innocent of signs disappears into a network of simulation.

In postmodernist debates over the past few decades claims that simulation is superseding representation have raised fundamental questions of the future of human political and cultural agency. Baudrillard himself, however, is no fan of postmodernist theory: 'The post-modern is the first truly universal conceptual conduit, like jeans or coca-cola . . . It is a world-wide verbal fornication' (Baudrillard 1996a: 70). This is in stark contrast to those who use Baudrillard's theorising as the exemplification of postmodern thought. Douglas Kellner, for instance, considers Baudrillard as resignedly telling the story of the death of the real without taking political responsibility for this story. Others consider him the media pessimist *par excellence*, who argues that the total coverage of the real with signs is equivalent to its absolute disappearance. Still others celebrate Baudrillard as an elegant 'so what?' in the face of the collapse of all values. All, however, omit the central point regarding his theory of simulation: that it functions and has effects – it is operational – and is therefore hyper-*real* rather than hyper-*fictional*. The grounds of this operativity are always, for Baudrillard, technological: 'Only technology perhaps gathers together the scattered fragments of the real' (Baudrillard 1996b: 4). 'Perhaps', he adds, 'through technology, the world is toying with us, the object is seducing us by giving us the illusion of power over it' (1996b: 5).

Baudrillard, who published an early (1967) and positive review of McLuhan's *Understanding Media*, makes it clear that the ground of hyperrealism is technology as a complex social actor over which we maintain an illusion of control. To cite a typically contentious Baudrillardian example, electoral systems in developed democratic states do not empower an electorate, but rather determine the exercise of democracy in cybernetic terms: voting for party X rather than party Y consolidates the governance of binary coding over political systems. This constitutes a 'simulation' of democracy not in the sense that there are really and in fact more complex political issues underlying this sham democracy; but rather in the sense that real and effective politics is now conducted in precisely this new scenario. Choice has become the only reality that matters, and it is precisely quantifiable. Thus the simulation, or transposition of democracy onto another scene, concerned exclusively with a hypertrophied 'choice', is the only political reality there is. It is for this reason that simulations constitute, for Baudrillard, the hyperreality of cybernetic governance. The 'perfect crime' to which the title of one of Baudrillard's works alludes is not the destruction of reality itself, but the destruction of an illusory reality beyond the technologies that make it work (Baudrillard 1996b). The effect is not a loss of reality, but the consolidation of a reality without an alternative.

Where commentators on contemporary cultural change have seized upon the concept of simulation is in noting a shift from 'representation' to simulation as dominant modes of the organisation of cultural objects and their signifying relationships to the world. According to such scholars 'representation' was conceived to be a cultural act, an artefact of negotiated meanings, pointing, however unsuccessfully or incompletely, to a real world beyond it. 'Simulation', they assert, supplants these negotiated relationships between social and cultural agents *and reality*, replacing them with relationships that operate *only within culture* and its mediations:

The theory of simulation is a theory of how our images, our communications and our media have usurped the role of reality, and a history of how reality fades.

(Cubitt 2001: 1)

Such critical approaches draw on theories that identify profound cultural, economic and political shifts taking place in the developed world in recent decades. A defining moment in the development of this approach is Guy Debord's *Society of the Spectacle* (1967), which argues that the saturation of social space with mass media has generated a society defined by spectacular rather than real relations. Although there are various approaches and positions within this broad trend, they generally share the assumption that the emergence in the postwar period of a consumption-led economy has driven a culture which is dominated and colonised by the mass media and commodification. The rise of this commercialised, mediated culture brings with it profound anxieties about how people might know, and act in, the world. The sheer proliferation of television screens, computer networks, theme parks and shopping centres, and the saturation of everyday life by spectacular images so thoroughly mediated and processed that any connection with a 'real world' seems lost, adds up to a simulated world: a hyperreality where the artificial is experienced as real. Representation, the relationship (however mediated) between the real world and its referents in the images and narratives of popular media and art, withers away. The simulations that take its place also replace reality with spectacular fictions whose lures we must resist. In broad outlines, this remains the standard view of Baudrillard's theses.

Accordingly, Baudrillard's controversial and often poorly-understood versions of simulation and simulacra have proved very influential on theories and analysis of postwar popular and visual culture. The nature of the ascendancy of this order of simulation over that of representation has been posited as being of fundamental importance to questions of the future of human political and cultural agency. Cultural and critical theory, when faced with the manufactured, the commodified and the artificial in modern culture, has identified the simulational and simulacral character of postwar culture in the developed world – a culture, it is claimed, that is increasingly derealised by the screens of the mass media, the seductions and veillings of commodification, and (more recently) the virtualisations of digital culture. For instance, Fredric Jameson describes the contemporary world as one in which all zones of culture and everyday life are subsumed by the commodifying reach of consumer capitalism and its spectacular media:

a whole historically original consumers' appetite for a world transformed into sheer images of itself and for pseudo-events and 'spectacles' . . . It is for such objects that we reserve Plato's concept of the 'simulacrum', the identical copy for which no original has ever existed. Appropriately enough, the culture of the simulacrum comes to life in a society where exchange value has been generalized to the point at which the very memory of use value is effaced, a society of which Guy Debord has observed, in an extraordinary phrase, that in it 'the image has become the final form of commodity reification . . .'.

(Jameson 1991: 18)

Similarly, for Cubitt, as reality fades, the materiality of the world around us becomes unsteady, 'the objects of consumption are unreal: they are meanings and appearances, style and fashion, the unnecessary and the highly processed' (Cubitt 2001: 5).

What is at stake for these theorists is that any sense of political agency or progressive knowledge is lost in this seductive, consumerist apocalypse. The relationship between the real and the mediated, the artificial and the natural, implodes. It is also clear how the technological sophistication, seductive/immersive and commercial nature of videogames might be seen as a particularly vivid symptom of this postmodernist condition (Darley 2000). It is equally clear, however, that these critics' conceptions of Baudrillard in general and simulation

in particular are at best partial, and at worst wholly misleading. For these reasons, it is wholly appropriate to refer to such a constellation of theories as 'postmodernist', as it is to argue that Baudrillard's simulation is not postmodernist. Far from providing any specificity to the concept of simulation, the postmodernist approach generalises it to the point where it becomes an entire theory of culture (the pervasiveness of technological visual culture is further discussed in **1.5.3**, and with specific regard to the theory of the 'virtual' in **2.1–2.6**).

Computer simulation

The second use of the concept reflects a more specific concern with simulation as a particular form of computer media (Woolley 1992, Lister *et al.* 2003, Frasca 2003, Prensky 2001). Just as a confusion of imitation, representation or mimesis with simulation arises in postmodernist uses, critical approaches to computer simulation tend to take a more nuanced attitude to the mimetic elements sometimes (but not always) present in simulation. The principal difference is, in this case, that simulation is not a dissembling, illusory distraction from the real world (like Eco's Disneyland) but rather a model of the world (or of some aspect of it). This context presents a more specific and differentiated use of simulation than that of the postmodernists. For some (writers, engineers, social scientists, military planners, etc.) the computer simulation models complex and dynamic systems over time in ways impossible in other media.

Marc Prensky, in a book that espouses the use of computer games in education and training, offers three definitions of simulation:

- any synthetic or counterfeit creation
- creation of an artificial world that approximates the real one
- a mathematical or algorithmic model, combined with a set of initial conditions, that allows prediction and visualisation as time unfolds (Prensky 2001: 211)

The first and second of these definitions recall the confusion of some aspects of simulation with imitation. That a simulation is a 'counterfeit' (definition 1) suggests it may be smuggled in, unnoticed, to stand in for 'the real thing'. That it is 'synthetic', by contrast, suggests only that it has been manufactured. Just as it would be false to say that any manufactured product, by virtue of being manufactured, counterfeits a reality on which it is based (what does a car counterfeit?), so it would be equally false to argue that all simulations 'counterfeit' a reality. In short, if manufacturing goods adds additional elements to reality, so too, surely, should manufacturing simulations.

Definition 2 repeats this error: an artificial world does not necessarily approximate the real one. Consider, for example, the work of exobiologists – biologists who research the possible forms life on other worlds might take. An exobiologist, for instance, might simulate a world with denser gravity than ours; this would entail that, if life evolved on such a world, it would take a different form, with creatures perhaps more horizontally than vertically based, replacing legs with other means of locomotion, and so forth. Undoubtedly such a world is simulated, but it precisely does not approximate ours. In a more familiar sense, this is what we encounter in videogame-worlds, and the rules governing the motion of characters, the impact and consequence of collisions, and so on. In particular, the issue of 'virtual gravity' (generally weaker than the terrestrial variety with which we are familiar) demonstrates the extent to which such simulations owe their contribution to reality to their differences from, rather than approximations of, our own. We will see in section **5.3** that historians and theorists

of automata quite specifically differentiate between automata proper and simulacra – in brief, not all automata are simulacra, insofar as they do not necessarily approximate the human form. These examples alone ought to make us wary of suggesting any equivalence between imitation and simulation.

For the task in hand – the identification of analytical concepts and approaches in the study of computer simulation in the context of a general account of new media studies – Prensky's third definition of simulations as material (and mathematical) technologies and media is very useful. It recalls, for instance, both the temporal aspects of simulation (see below) and the Baudrillardian sense, reflecting on the notion of simulation as productive of reality, neither a 'counterfeit' nor necessarily an approximation of a real world beyond them. This is helpful in that such an account makes more obvious sense of those simulations used in many different contexts, for example by economists to predict market fluctuations, and by geographers to analyse demographic change. Unlike the postmodernist use of the term, this gain in applicability does not cost a loss of specificity. The processes of simulation are also foregrounded in gaming, since all digital games are simulations to some extent. Prensky cites Will Wright (the creator of *SimCity*, *The Sims*, and numerous other simulation games) discussing simulations as models quite different from, for example, balsa wood models. The simulation is temporal, modelling processes such as decay, growth, population shifts, not physical structures. The model, we might say in more familiar terms, really does precede the reality it produces (see again section 2.6 below).

In computer game culture the term 'simulation games' refers to a specific genre in which the modelling of a dynamic system (such as a city in *SimCity* or a household in *The Sims*) provides the main motive of the game as structure and gameplay experience

Simulation games

In recent years, game studies has adopted analytical, formal and descriptive approaches to the specificity of computer simulation software. 'Simulation' here refers to the particular character and operations of games, particularly computer and videogames, as processual, algorithmic media. Distinctions are made between simulation as a media form that models dynamic, spatio-temporal and complex relationships and systems (for example, of urban development and economics in *SimCity*) and the narrative or representational basis of other, longer-established, media (literature, film, television, etc.).

unlike traditional media, video games are not just based on representation but on an alternative semiotical structure known as simulation. Even if simulations and narrative do share some common elements – character, settings, events – their mechanics are essentially different. More importantly, they also offer distinct rhetorical possibilities.

(Frasca 2003: 222)

Gonzalo Frasca's simulations are media objects that model complex systems. They are not limited to computer media (pre-digital machines and toys can simulate) but come into their own with the processing affordances of computing. This emphasis on the simulational character of computer and videogames has proven to be productive in the task of establishing the distinctiveness of the videogame as a hybrid cultural form, emphasising features, structures and operations inherited from both its computer science and board game forebears over other sides of its family – notably its media ancestors (literature, cinema, television).

What distinguishes the computer simulation is precisely what video games remind us of: it is a dynamic real-time experience of intervening with sets of algorithms that model any environment or process (not just imitating existing ones) – playing with parameters and variables.

So simulation in a videogame could be analysed thus:

- 1 productive of reality – so in *Doom*, *Tomb Raider*, or *Grand Theft Auto* the game is representational on one level – tunnels, city streets, human figures, monsters and vehicles – part of the universe of popular media culture, but the experience of playing the game is one of interacting with a profoundly different kind of environment. These maps are not maps of any territory, but interfaces to a database and the algorithms of the computer simulation;
- 2 this 'reality' then is mathematically structured and determined. As Prensky points out, *The Sims* adds a fun interface to a cultural form rooted in science and the mathematical and traditionally presented only as numbers on the screen. Games such as *SimCity* incorporated a variety of ways of modelling dynamic systems – including linear equations (like a spreadsheet), differential equations (dynamic system-based simulations like *Stella*) and cellular automata – where the behaviors of certain objects come from their own properties and rules for how those properties interacted with neighbors rather than from overall controlling equations.

(Prensky 2001: 210–211).

Note: Prensky makes a clear connection here between the playful simulation of popular videogames and the computer science of Artificial Life. For more on ALife and cellular automata see 5.3.5.

- 3 as we have seen, exobiology and some videogames clearly indicate that simulations can function without simulating or representing already existing phenomena and systems. The mimetic elements of *Tetris*, *Minesweeper* and *Donkey Kong* are residual at best, yet each of these games is a dynamic simulated world with its own spatial and temporal dimensions and dynamic relationships of virtual forces and effects. They simulate only themselves.
- 4 thinking of videogames as simulations also returns us to the assertion that the player's experience of cyberspace is one not only of exploration but of realising or bringing the gameworld into being in a semiotic and cybernetic circuit:

The distinguishing quality of the virtual world is that the system lets the participant observer play an active role, where he or she can test the system and discover the rules and structural qualities in the process.

(Espen Aarseth 2001: 229)

For the cybernetic nature of videogame play see 4.5.6 and 5.4.4

Summary

Ostensibly, these three positions have quite different objects of concern: the computer simulation of interest to game studies is not postmodernist simulation. Game studies is more modest – keen to establish the difference of games and simulations from narrative or representational media forms, rather than claiming simulation as an overarching model of contemporary culture. To analyse a videogame as a computer simulation is to understand it as an instance in everyday life, rather than as an all-encompassing hyperreality. Moreover, the screen metaphors of the postmodernist simulation carry little sense of the dynamic and procedural characteristics of computer simulation. Studied as such, computer simulations can be seen not only as the visual presentation of artificial realities (as, again, the screens of hyperreality suggest) but as the generation of dynamic systems and economies, often with (and always in videogames) an assumption of interactive engagement written into the models and processes.

The three broad concepts of simulation outlined above overlap however. Postmodernist simulation, though formulated before the rise of computer media to their current predominance and predicated on – crudely speaking – the electronic media and consumer culture, is now widely applied to the Internet, Virtual Reality and other new media forms. Discussions of the nature of computer simulations often also entail a consideration of the relationships (or lack of) between the computer simulation and the real world. Both make a distinction between ‘simulation’ (where a ‘reality’ is experienced that does not correspond to any actually existing thing), and ‘representation’ (or ‘mimesis’, the attempt at an accurate imitation or representation of some real thing that lies outside of the image or picture) – though often with very different implications and intentions.

To sum up: within all of these approaches to simulation there is a tendency to miss a key point: simulations are real, they exist, and are experienced within the real world which they augment. Since, as *Donkey Kong* and the alien creatures of exobiology teach us, not all simulations are imitations, it becomes much easier to see simulations as things in their own right, rather than as mere representations of other (‘realer’) things.

1.2.7 Conclusion

The characteristics which we have discussed above should be seen as part of a matrix of qualities that we argue is what makes new media different. Not all of these qualities will be present in all examples of new media – they will be present in differing degrees and in different mixes. These qualities are not wholly functions of technology – they are all imbricated into the organisation of culture, work and leisure with all the economic and social determinations that involves. To speak of new media as networked, for instance, is not just to speak of the difference between server technology and broadcast transmitters but also to talk about the deregulation of media markets. To talk about the concept of the virtual is not just to speak of head-mounted display systems but also to have to take into account the ways in which experiences of self and of identity are mediated in a ‘virtual’ space. Digitality, Interactivity, Hypertextuality, Virtuality, Networked Media and Simulation are offered as the beginnings of a critical map. This discussion of the ‘characteristics’ of new media has merely established the grounds upon which we might now begin substantially to address the questions that they raise.

1.3 Change and continuity

From this section to the end of Part 1 (1.3–1.6.6) we now change our tack. So far we have considered, as promised at the outset, what it is that we take to be ‘new media’ and we have gone as far as to suggest some defining characteristics. We now take up the question of what is involved in considering their ‘newness’. Enthusiastic students of media technologies might wonder why this is a necessary question. Why do we not simply attempt to describe and analyse the exciting world of media innovation that surrounds us? Writing in this manner would be at the mercy of what we referred to in the introduction as permanent ‘upgrade culture’ – no sooner published than out of date because it failed to offer any critical purchase on the field. There are plenty of existing sites for readers to catch up on latest developments most of which are designed to facilitate the reader’s consumption. Our purpose is to facilitate critical thinking. In order to do that we need to get beyond the banal pleasures of novelty to reveal how the ‘new’ is constructed. Our aim here is to enable a clarity of thought often *dis-*abled by the shiny dazzle of novelty. We hope to show that this centrally involves knowing