Unlike perhaps the majority of images, including many photographs, movies, TV, and computer-generated images, which tend to function as 'windows on the world' and which dissolve the surfaces which carry them so that we look through the surface or screen to the 'thing itself', these trompe l'oeil images have a different representational tactic. Rather than framing and then opening onto the real; they supplant the real, they claim to take its place. They sit on its surface and pretend to be part of it.

If we insist on thinking about these images as 'signs' or as language-like collections of signs which represent things, then we would have to say that as representations, they are at the end of the spectrum where maximum resemblance is sought between the sign and the object signified. They are low on symbolic abstraction. In this sense the room for 're-presentation' and 'mediation' (in the media studies sense of importing meanings into things) is low. Their real success seems to lie in the attempt to duplicate the conditions in which we would have looked at the objects they represent (as well as their surfaces and appearance). In this way, trompe l'oeil images constitute a kind of degree zero of 'style', of evident artifice. For this reason the artists who made them were, as were those who painted Panoramas, given low status in the hierarchy of artistic production and there was doubt as to whether they would be allowed to become members of art Academies (Grau 2003: 68).

While these trompe l'oeil images do not themselves offer or afford the viewer immersion in the virtual picture space (as we noted, they sit on material reality's surface), they share with, and point strongly toward, the strategies of immersion employed by the producers of immersive architectural schemes, Baroque ceilings, and Panoramas. These are strategies to *remove or disguise the overt conditions of visual or pictorial representation*, the frame and the surface, and the point of difference – the edge – between the actual (the architecture, the Panorama's rotunda) and the virtual (the painted vistas seamlessly and credibly placed within these buildings' apertures). To put this another way, they carefully articulate the relationship and movement between the actual and the virtual. This is achieved as we move progressively from the early Renaissance fresco cycles which employed the new perspective technology, or the buildings that were conceived and designed from the outset to combine actual and virtual space, through the technique which underpins the Panorama (the rendering of continuous perspectival images on a 360 degree surface) and the hiding of the edges of the images by the design of the viewing station and the 'faux terrain', to the moving of the image and the reinforcement of the visual experience by light, wind and sound.

'Faux terrain' refers to the way the seam or edge between architectural and painted space in Renaissance and Baroque 'spaces of illusion', and later in Panoramas, was disguised or hidden by a transitional area of three-dimensional 'props' such as faked grass, earth, bushes, fences etc.

On this basis another way of understanding a simulation emerges. It is the digital forms of immersive images (our virtual realities and environments) which we now understand as simulations. It may be the complexity (and 'black-boxed' invisibility) of the visual and informational technologies employed, on the one hand; at times the interactive relationship with the image, at others the sheer optical verisimilitude of effect, that push us to want to distinguish these virtual spaces from mere 'representations'. Yet, in a final twist, where visual or image culture is concerned (if not game culture), even when no corresponding reality exists for what is simulated, a degree of optical realism is required, the resources for which are still now found in photo-realist representations. As we have seen, 'realistic representations' are not realistic simply because they are 'like' what they represent. Mimesis is not an adequate theory of representation. They must employ visual codes (of which photo-realism is one) that we accept as the signs of the real.

2.7 Digital cinema

Questions of simulation and photo-realism are key to understanding recent developments in popular cinema. Computer-generated imagery (CGI), from its early experimental and explicit

uses in special effects in films such as *Tron* in 1982 or Pixar's short animated films (e.g. *Luxo Jr*. 1986) to blockbusters such as *Terminator 2: Judgement Day*, *Jurassic Park* and *Toy Story* in the mid-1990s, is now a feature of many mainstream popular films, is usually key to big budget blockbusters, and has virtually elimated hand-drawn and cel animation in animated feature films. While it is widely used in postproduction to generate hard-to-shoot backgrounds or lighting effects, it is in its explicit application as spectacular special effects that it has generated intense excitement, anxiety, and popular and critical debate.

In this section we will consider the popularisation of **CGI** (computer-generated imagery), and its use in special effects and computer animation. These forms will be considered, on the one hand, as materially and historically situated technologies and media, and on the other as informing a technological imaginary in which the impact of digital technology on cinema is presented as either symptomatic of, or a causal factor in, the 'virtualisation' of the modern world. We will consider the implications of CGI's shifting of animation from the margins of cinematic culture back to its centre, and ask what happens to the audiences of digital cinema.

Cinema and VR

> [Virtual reality] is frequently seen as part of a teleology of the cinema – a progressive technological fulfilment of the cinema's illusionistic power.
>
> (Lister 1995: 15)

Popular ideas about, and expectations of, the potential of VR are inseparable from the cinema as an aesthetic form. While the ubiquity and simultaneity of broadcast television, or the communication 'spaces' of the telephone or Internet are in many ways more significant to the development of VR technologies and applications, it is the clarity and seduction of cinema's visual imagery and the 'immersion' of its viewers against which emerging (and potential) VR experiences are measured. As we will see, cinema is a key factor in VR's 'remediations'.

Conversely, cinema has developed and disseminated images, ideas and dreams of VR and the virtual particularly in recent science fiction films. Moreover, the design of certain VR systems draws heavily on cinematic imagery, forms, and conventions. And, significantly, if we take the term 'cinema' to mean a broad field of moving image technologies and cultures rather than the narrow industrial and ideological establishment of the dramatic, live action, feature film, then the hugely popular medium of the videogame must be seen as central to developments in, and ideas about, digital cinema. The videogame has been integral to the development of a technological imaginary of cyberspace and VR (see Parts 4 and 5) and has opened up virtual worlds, artificial intelligences and computer-generated characters for popular play and consumption.

To the distinction between immersive and metaphorical VR we could here add one more, what Ellen Strain calls 'virtual VR' (Strain 1999: 10). On one level this is simply the representation of speculative forms of VR and cyberspace in science fiction films such as *Lawnmower Man* (1992), *Strange Days* (1995), *Johnny Mnemonic* (1995) (as well as subsequent films including David Cronenberg's *eXistenZ* 1999). On another level Strain refers to the phenomenon of fictional and speculative images of VR becoming blurred with actual existing forms and uses of VR technologies. Given the point made in **2.6**, that VR is in fact a rather exclusive experience and not a mass medium, it is not surprising that films have projected fantasies of digital worlds that have generated a misleading sense of the current state, or putative soon-to-be-realised future, of VR.

See special issues of *Screen* 40.2 (Summer 1998), and *Convergence* 5.2 (1999)

See **1.2.5**, **1.2.6**, **2.6**, **5.4.2** for more considered discussion of 'the virtual' 1.2.5 Virtual

2.1–2.6

5.4.2 Cybernetics and the virtual

Key text: Philip Hayward, 'Situating cyberspace: the popularisation of virtual reality', in Philip Hayward and Tana Wollen (eds) *Future Visions: new technologies of the screen*, London: BFI, pp. 180–204 See Part 4 for further discussion of the relationships between popular culture and the development of computer media

Both VR researchers and cultural theorists have drawn heavily on popular science fiction literature and film as points of reference and as resources for speculation and possibility. Philip Hayward lists the subcultural and popular cultural points of reference of the early VR enthusiasts: to science fiction he adds New Age mysticism, psychedelia and rock culture. This promotion of the possibilities of VR through popular cultural discourses not only shapes public expectations but may even affect VR research itself:

> These discourses are significant because they have shaped both consumer desire and the perceptions and agenda of the medium's developers. In a particularly ironic twist . . . they have created a simulacrum of the medium in advance (against which its products will be compared).
>
> (Hayward 1993: 182)

It is important to note that this is not necessarily naive; there are instances where this is a particular strategy: reading (science) fictions as one would read any other document or source of data. (See David Thomas, 'The technophiliac body: on technicity in William Gibson's cyborg culture', in David Bell and Barbara M. Kennedy (eds) *The Cybercultures Reader*, London: Routledge, 2000, pp. 175–189.) Thomas there reads William Gibson's fictional worlds as straight sociological data, from which informative results are gathered (see **5.1**).

2.7.1 Virtual realism

There is great excitement about the future possibilities of immersive or interactive entertainment, but also fear that digital technologies are leading film into a descending spiral of spectacular superficiality. Such fears are evident in both popular film criticism and academic, **postmodernist** discourses. They are evident in the critique and conceptualisation of digital images specifically – images which threaten our understanding of the world as they present themselves with the look of photography, an illusion of photography's 'indexicality'. They seem to speak to us of the real world but are synthetic and fabricated. This troubled relationship between images and the world they claim to represent is also applied more generally to Western culture as a whole, now characterised, it is argued, by a waning of 'meaning', becoming (and the metaphors are telling) simulated and flattened, screen-like.

Film theory and media studies are centrally concerned with the relationship between popular representations and the real world. The term '**realism**' is therefore a useful one in this context, not least because it highlights the argument that any representation, however technologically advanced, is a cultural construction and not the 'real' itself. That is to say, a critical notion of realism foregrounds not the 'capture' of the real but its articulation or constitution in representations. However, as we will see, an emphasis on realism and representation can carry assumptions about the reality of images themselves, about illusions etc.

> [T]there is no realism, but there are realisms.
>
> (Ellis 1982: 8)

John Ellis identifies a number of realist conventions in cinema and television. They include:

- common-sense notions and expectations, such as correct historical details in costume drama, or racial stereotypes in war films;

- adequate explanations of apparently confusing events, establishing logical relationships between cause and effect in events;
- coherent psychological motivations for characters.

Ellis points out that forms not generally seen as 'realist', such as horror and comedy, are made coherent by these conventions (Ellis 1982: 6–9)

Some of these are contradictory, they often co-exist within the same film or television programme. We could add others: the assumption of truth in documentaries, or the social realism of politically motivated film-makers such as Ken Loach.

Film theory has extensively explored the ideological workings of realisms in cinema. Debates in the French journal *Cahiers du Cinéma* and the British journal *Screen*, in the late 1960s and 1970s, though diverse and at times antagonistic, shared the premiss that dominant cinematic realist codes construct a fundamentally conservative view of reality. In establishing a coherent 'real world' within the film, this critique argues, Hollywood films deny the contradictions of a reality characterised by class conflict, gender inequalities and hidden power structures. Realist codes ensure that conflicting points of view and power relationships within the film's fictional world are always resolved or reconciled. A world riven by contradiction is always, by the end of the last reel, whole, coherent – if the ending is not always entirely happy, it does at least provide narrative 'closure' (McCabe 1974). These debates argue, then, that Hollywood film production and reception do not present the real world; quite the opposite, they mask or mediate the real world and real social relations. Different realisms are not mere aesthetic choices, but each correlate with a particular ideology of what constitutes the 'real world' in the first place.

See MacCabe (1974). For an introduction to theories of realism in film, see Lapsley and Westlake (1988: 156–180)

There are a number of ways in which these debates relate to our discussion of digital cinema. They represent a sustained and influential enquiry into the relationships between representations and the real. They raise questions of the meanings of popular visual culture in terms of ideology, and of audience. However, it is significant that of the various realisms discussed so far most do not rely for their effects on the photographic image as an index of reality, or even on visual communication at all. Some would apply equally well to radio as to television and cinema. Similarly, while the technological apparatus of cinema and television is sometimes discussed in these debates, it is rarely identified as a key factor in the construction of the ideological effects of these realisms. The following quotes give an indication of a significant shift in the critical consideration of realism when applied to recent technological change in cinema:

> The drive behind much of the technical development in cinema since 1950 has been towards both a greater or heightened sense of 'realism' and a bigger, more breathtaking realization of spectacle. Both of these impetuses have been realized through the development of larger, clearer, more enveloping images; louder, more multi-layered, more accurately directional sound; and more subtle, 'truer-to-life' colour. The intention of all technical systems developed since the beginning of the 1950s has been towards reducing the spectators' sense of their 'real' world, and replacing it with a fully believable artificial one.
>
> (Allen 1998: 127)

For Allen, in the context of a discussion of CGI special effects, realism is no longer film theory's set of ideological and formal conventions of narrative, character, plot and hierarchies, but rather technical and aesthetic qualities of sound and image. Realism now operates between the image and its qualities and the technological apparatus that generates it. What we see here is an uncomfortable conflation of three distinct notions of realism: first,

photographic or cinematographic verisimilitude or indexicality (i.e. the photographic image is seen to be privileged among all other representations in its grasping of the real world); second, the spectacular or illusionistic; and third, the 'immediate' grasping of reality in which the medium itself seems to flicker out of the picture. Thus the more visually 'realistic' (or in Bolter and Grusin's terms 'immediate') a film or special effects sequence is, the more artificial or illusionistic it is. So, as Bolter and Grusin, discussing special effects-driven films like *Jurassic Park* point out:

> We go to such films in large part to experience the oscillations between immediacy and hypermediacy produced by the special effects . . . the amazement or wonder requires an awareness of the medium. If the medium really disappeared, as is the apparent goal of the logic of transparency, the viewer would not be amazed because she would not know of the medium's presence.
>
> (Bolter and Grusin 1999: 157)

These apparent paradoxes – that heightened realism is sophisticated illusion; and that audiences are both taken in by spectacle yet understand its artifice – run through much of the critical commentary on popular CGI cinema. To explore these apparent paradoxes and to suggest how CGI in popular film might be critically examined as spectacular imagery and technological advance, we will define four key terms: verisimilitude, photorealism, indexicality and simulation/**hyperrealism**.

Verisimilitude

As we have seen, discussions of the application of digital imaging to cinema generally centre around the realism of the image, or verisimilitude. Verisimilitude, as a type of representation, claims to capture the visual appearance of the world, people and objects, as they appear to the human eye. The trompe l'oeil genre of painting is a good example (see above). Special effects and computer animation are measured by their proximity to an 'unmediated' view of the real world. Verisimilitude is by and large taken for granted in conventional cinematography, given the photographic image's cultural status and technical characteristics, but in computer-generated imagery it becomes an object of interest to both producers and spectators. In *Toy Story* (1995), for example, the toy soldiers are lovingly rendered complete with the imperfections and tags of excess plastic characteristic of cheap moulded toys. This detail is offered to the audience as visually pleasurable – a knowing reference to the minutiae of childhood experience, and an invitation to acknowledge the animators' wit and attention to detail.

Indexicality

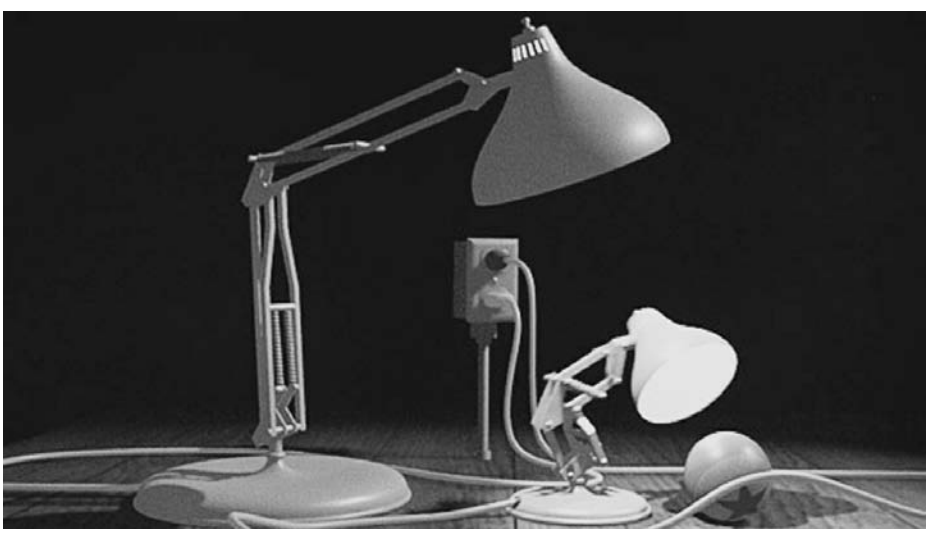
From its inception, photography has claimed for itself a more direct, less mediated relationship with the world than other forms of picture making. For Fox-Talbot photography was the 'pencil of nature', whereas more recently Susan Sontag related the photograph to footprints or deathmasks – images created through a direct physical relationship with their referent, in photography's case through light reflected from objects and environments striking photosensitive emulsion. Current anxieties about the synthetic (yet photo-real) moving image were prefigured in the arrival of digital photography. The ideological and artefactual nature of the photograph was forgotten in fears about how we would know the world once its priviledged recording medium could be so easily manipulated.

See Lister (ed.) 1995

Photorealism

> In cases where a real-life equivalent is clearly impossible, such as the morphing effects in Terminator 2, the pictorial quality of the effect must be sophisticated and 'photorealistic' enough to persuade the audience that if, for example, a tiled floor transformed into a human figure in real life, it would look exactly like its screen depiction does.
>
> (Allen 1998: 127)

Here we see verisimilitude again, but with an important difference. These CGI sequences are not so much capturing external reality as simulating another medium: in Bolter and Grusin's terms, 'remediation' – the visual replication of photography and cinematography. Indeed photo-realism is measured more by its figuration of these other media than by any capture of the look of the real itself. The quote from Allen (1998) demonstrates that this distinction is not always a clear one. Confusion and slippages between the 'real' and 'representation as realist' characterises much recent criticism of the digital moving image. A number of important issues relate to this confusion. The term photo-realistic implies a representation that has not been produced by photographic techniques, but looks as though it has. What does 'photo-realistic' mean when applied to an event or effect that couldn't be photographed? Some special effects construct real world events which are difficult or expensive to film conventionally (explosions, ships sinking, etc.), whilst others, as in the *Terminator 2* sequence or in *The Matrix*, depict events that could never be photographed and hence have no referent against which their effectiveness can be measured. Thus photography here functions not as some kind of mechanically neutral verisimilitude but as a mode of representation that creates a 'reality effect'; that is to say, the onscreen event is accepted because it conforms to prevailing or emergent realist notions of screen spectacle and fantasy, not the 'real world'. Thus, as Lev Manovich argues, again in relation to *Terminator 2*:



2.24 Luxor Junior, © Pixar.

> For what is faked, of course, is not reality but photographic reality, reality as seen by the camera lens. In other words, what digital simulation has (almost) achieved is not realism,

> but only photorealism . . . It is only this film-based image which digital technology has learned to simulate. And the reason we think that this technology has succeeded in faking reality is that cinema, over the course of the last hundred years, has taught us to accept its particular representational form as reality.
>
> (Manovich 1996)

Hyperrealism

The use of terms such as 'simulation', 'virtual reality' and '**hyperrealism**' in the criticism of popular new media is often confused and imprecise. Hyperreality is used by Jean Baudrillard and Umberto Eco, though with different implications. Both take the theme park Disneyland as an example. For Eco, Disneyland is the ultimate example of what he sees as an emergent postmodernist culture characterised by the 'fake' (others include waxwork museums and animatronic displays), whereas for Baudrillard our enjoyment of the theme park's emphasis on its own spectacular 'hyperreality' serves to distract us from the fact that the real world as a whole is now hyperreal: there is no real left to 'fake'. For Baudrillard hyperreality is synonymous with simulation (Eco 1986; Baudrillard 1983).

The term 'hyperrealism' however, is ostensibly quite different. It is used to identify a distinct and dominant aesthetic in popular animation, developed by the Walt Disney Corporation in their animated feature films, beginning with *Snow White and the Seven Dwarves* in 1937. Disney's hyperrealist aesthetic is pertinent to the study of digital cinema. Disney animation presents its characters and environments as broadly conforming to the physics of the real world. For example, Felix the Cat or even the early Mickey Mouse were never constrained by gravity or immutability as Snow White or Pocahontas are. They were characterised by what Eisenstein called 'plasmaticness', the quality of early cartoon characters and environments to stretch, squash and transform themselves (Leyda 1988). Hyperrealism also covers the Disney studio's application of realist conventions of narrative, logical causality and character motivations – breaking with the largely non-realist and anarchic dynamics of the cartoon form. Here, then, hyperrealism is a measure not so much of the proximity of the representation to its referent but of the remediation of the codes (and attendant ideologies) of live action cinema.

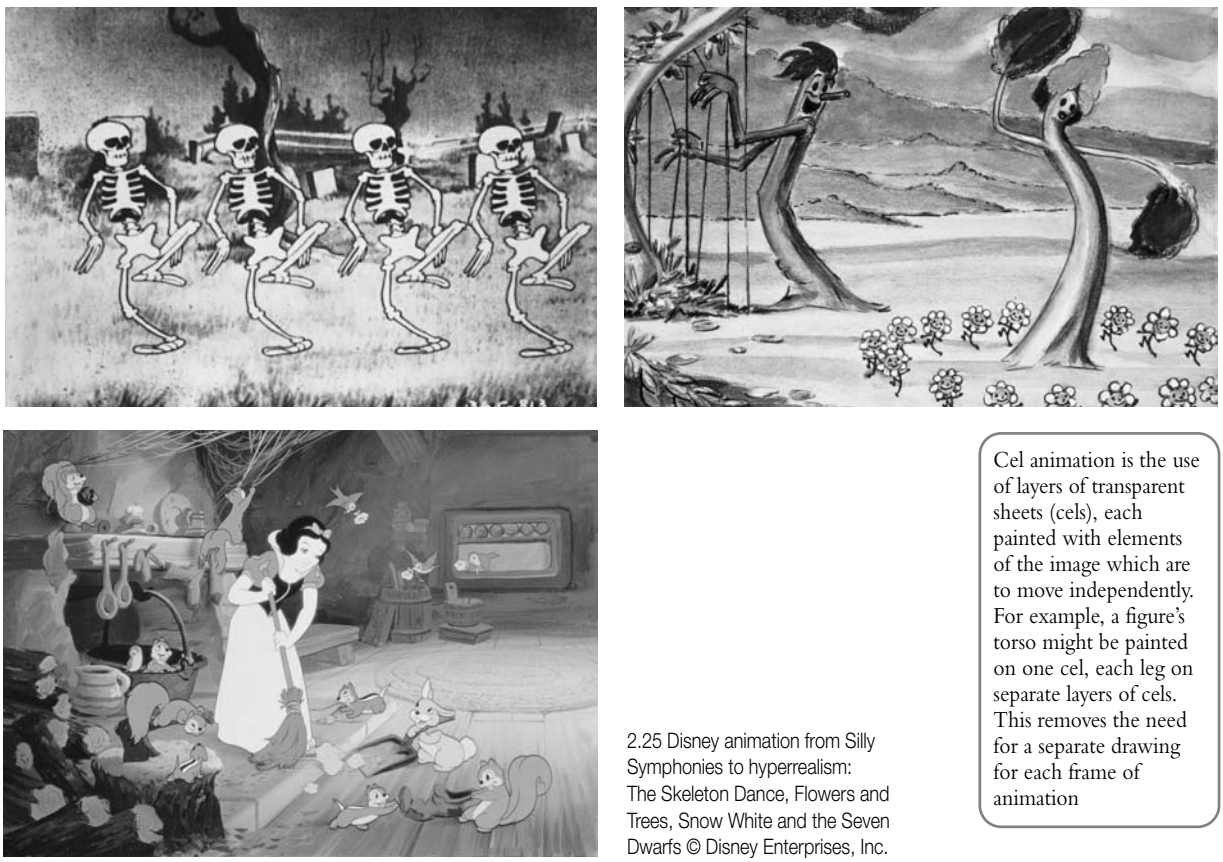
This distinction between 'simulation' and 'imitation' or representation is discussed further in **1.2.6** Simulation; **2.6.3** and **5.3.1** (see also Glossary)

5.3.1 Automata: the basics

However, given the important role of Disney in the development of popular spectacular culture in general (theme parks as well as movies), and in the pioneering of new cinematic technologies (from sound and colour in cartoons, the Multiplane camera in *Snow White and the Seven Dwarves*, through to the CGI innovations of *Tron* and the corporation's collaborations with the computer animation studio Pixar in the 1990s), it could be argued that the concept of hyperreality and the animation aesthetics of hyperrealism are closely connected.

However, hyperrealism in the context of animation, as its 'hyper-' prefix suggests, is not wholly constrained by live action conventions. Disney hyperrealist animation never fully remediated the live action film – it always exceeded verisimilitude. This is evident in the graphic conventions of caricature in character design, as well as in the exaggeration of the forces of the physical world. The verisimilitude of these films always operates in tension with the graphic limitations and possibilities of drawn animation, the vestiges of plasmaticness in conventions of 'squash and stretch', metamorphosis, as well as the often fantastic subject matter (talking animals, magic, fairy tales and monsters).

Thus 'hyperrealism' can conflate the 'remediation' of live action film within animation (and photo-realism in CGI) with a rather indistinct notion of contemporary culture as increasingly



2.25 Disney animation from Silly Symphonies to hyperrealism: The Skeleton Dance, Flowers and Trees, Snow White and the Seven Dwarfs © Disney Enterprises, Inc.

Cel animation is the use of layers of transparent sheets (cels), each painted with elements of the image which are to move independently. For example, a figure's torso might be painted on one cel, each leg on separate layers of cels. This removes the need for a separate drawing for each frame of animation

virtual. These two senses come together in a more concrete way in recent computer-animated films, notably the collaborations between the Pixar Studio and Disney on feature films such as *Toy Story* (1995) and *A Bug's Life* (1998), or in Dreamworks' *Antz* (1998) and *Shrek* (2001).

Disney's hyperrealist aesthetic has also been interpreted as motivated by moral and ideological concerns. See Forgacs (1992), Giroux (1995), Giddings (1999/2000)

2.7.2 Reality effects

Photorealism in CGI and the hyperrealist imagery and narrative structures of Disney, Pixar and Dreamworks animated features are all examples of what Jean-Louis Comolli calls 'reality effects'. They are understood as, or are claimed to be, in different ways, offering a more realistic experience, a less mediated grasp of the world and experience. Each of these reality effects references not the actual external world directly, but rather other cinematic and media conventions. Photo-realism is the accurate depiction of photography, not an index of the world.

Jean-Louis Comolli's essay 'Machines of the Visible' (1980) foregrounds the reality or materiality of cinema and its technologies within the contexts of economic, ideological and historical change. He argues that any particular realism is determined not by any linear or teleological technological, or aesthetic development but by competing and historically contingent aesthetic conventions, technical developments and economic and social forces. The Hollywood film industry often presents an idealist view of cinematic technological progress to

See Wells (1998: 25–26)

ever-greater realism and immersion for its audiences. What is perhaps more surprising, as we will see, is that this idealism, reanimated by the novelty and excitement of digital technologies, has re-emerged within critical studies of digital cinema.

Though written before the advent of digital technology, Comolli's argument – that the history of technological change and realist forms is fundamentally discontinuous, not a linear path to mimetic perfection – is entirely relevant to current developments in film technology and aesthetics. For Comolli, this discontinuous history of cinema is not merely the product of competing technologies, studios and institutions, but of cinema as a 'social machine' – a form through which the dominant social configuration (class relationships within capitalism) attempts to represent itself. From this perspective verisimilitude is seen to be ideological, a set of realist codes, not the product of inevitable technological and aesthetic evolution. 'Realism' in general, and verisimilitude in particular, cannot be understood without considering determinations that are not exclusively technical but economic and ideological: determinations which go beyond the simple realm of the cinematic . . . which shatter the fiction of an autonomous history of the cinema (of its 'styles and techniques'). Which effect the complex articulation of this field and this history with other fields, other histories.

Jean Louis Comolli's (1980) essay is directly brought to bear on debates around new media in Timothy Druckrey (ed.) *Electronic Culture: Technology and Visual Representation*, New York: Aperture, 1996. See also Lev Manovich's application of Comolli's ideas to digital cinema (Manovich 1996). The line test or pencil test is a method by which an animated sequence is roughly sketched out on sheets of paper to establish timing, continuity and control over characters' movement, before the cels are painted. See Wells (1998: 21–28) for a materialist study of Disney hyperrealism.

We will look at three examples, the first from Comolli, the second relating to the historical development of animation, and the third a more recent example of the technology of cinematic realism.

Materialist approaches implicitly or explicitly oppose themselves to 'idealist' film criticism. The French critic André Bazin (1918–1958) is the key figure here. For Bazin, 'cinematic technology and style move toward a "total and complete representation of reality"' (Manovich 1997: 6). He sees cinema as the culmination of art's mimetic function, evidence of which can be seen in ancient cultures (see **1.4.1** for discussion of teleological accounts of technological change). Cinematic realism, moreover, should also 'approximate the perceptual and cognitive dynamics of natural vision' (ibid.). Hence Bazin's particular interest in techniques of photography generating depth of field, within which 'the viewer can freely explore the space of film image' (ibid.). See Bazin (1967). For a reassessment of Bazin's work, see Matthews (n.d.)

1.4.1 Teleological accounts of new media

Realism and film stock in the 1920s

From an idealist position the introduction, around 1925, of panchromatic film stock (black-and-white film which renders the colour spectrum into shades of grey more sensitively than previously) would be evidence of cinema's inevitable progress towards greater verisimilitude. However, Comolli argues that this 'progress' is as ideological as it is technical. A key determinant for the adoption of panchromatic stock lay outside cinema. It was a response to developments in the realist aesthetics of another popular medium: photography. 'The hard, contrasty image of the early cinema no longer satisfied the codes of photographic realism developed and sharpened by the spread of photography.' Significantly, this technical development entailed the decline of a previously accepted standard of visual realism: depth of field. Thus codes of shade, range and colour overthrow perspective and depth as the dominant 'reality effects' (Comolli 1980: 131).

Animation, hyperrealism and ant-realism

For Bazin, cinematic realism was predicated on the photographic image's indexicality and the assumption that it 'captures' the real world in a way that no other medium can. The privileged status of photography as a medium of verisimilitude accounts for much of the confusion around CGI. We have touched on this already in our definition of 'photo-realism'. The often-stated aim of CGI is to replicate the live action cinematographic image convincingly. Yet the hyperrealism of early animated feature films and shorts in the 1930s was introduced for reasons that were economic as much as aesthetic. Techniques such as the line test were

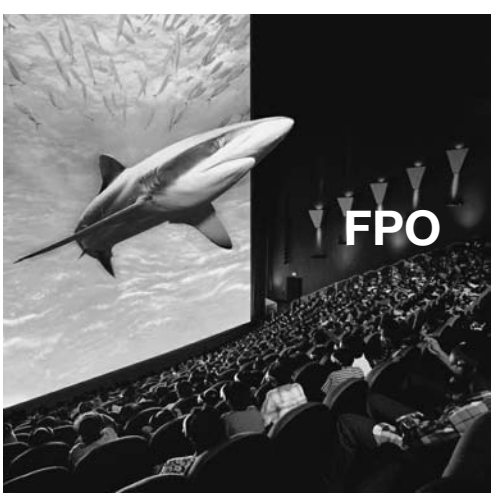
established to industrialise this relatively expensive mode of production, allowing divisions and hierarchies of labour and restricting the independence of individual animators.

In an analysis of the introduction of cel techniques to Hollywood cartoons such as those by Warner Brothers, Kristin Thompson explores the complex relationships between changes in technique, relations between different cinematic forms (live action and animation) and dominant ideologies in the Hollywood system. As in Disney's feature films, the cel animation techniques in cartoons served to industrialise cartoon production, but also offered new techniques of experimentation with, and disruption of, visual realist codes. The aesthetics of the cartoon and its position within Hollywood was the result of a struggle between two opposing forces:

> We have seen how cartoons use some devices which are potentially very disruptive (for example, mixtures of perspective systems, anti-naturalistic speed cues). As we might expect within the classical Hollywood system, however, narrative and comic motivations smooth over these disruptions . . . The fact that cel animation lends itself so readily to disruptive formal strategies suggests one reason why the conservative Hollywood ideology of cartoons developed as it did . . . Since disruption unmotivated by narrative is unwelcome in the classical system, Hollywood needed to tame the technology. Trivialisation provided the means.
>
> (Thompson 1980: 119)

IMAX and the immersive experience

The attraction of IMAX cinema lies primarily in its technology of spectacle. The 70-mm IMAX film is projected onto a 60-foot high screen, immersing the audience's field of vision with high-resolution images. Yet the technology that delivers this visually immersive experience at the same time rules out other well-established realist codes. Due to the practical difficulties of close framing, IMAX films tend not to use the shot–reverse shot conventions for depicting dialogue central to audience identification with characterdriven narrative (Allen 1998: 115). IMAX films have to draw on alternative realist codes, for example natural history documentary or the 'hyperrealism' of computer animation. We will now ask how these contradictory discourses of realism help us to understand the impact of digital media on popular cinema.



2.26 Stepping out of Alberti's window? IMAX. Deep Sea 3D, 2006. Warner Bros

2.7.3 Spectacular realism?

With the advent of popular CGI cinema then we are left with an apparently paradoxical notion of realism, one that refers both to a perceived immediacy but also to a heightened illusion and spectacle. It is a visual realism, a verisimilitude, premised not on the indexicality of photography, but on the 'wizardry' of digital synthetic imagery and its designers, that re-introduces that least realist cinematic form, animation, back into the mainstream. This paradox serves to foreground two further important factors:

1 the identification by a number of critics of significant continuities with earlier spectacular visual media forms – not only in cinema, or even twentieth-century popular culture more generally, but even further back – to the nineteenth or even the seventeenth century;

2 the critical concern with the visual image over other aspects of cinema.

In addressing the latter point – the dominance of the visual – it should be noted that the term 'spectacle' has two main connotations here. In everyday usage it refers to the visual seductions of cinema (special effects, stunts, song-and-dance routines, and so on) that apparently oppose, temporarily halt, or distract the spectator's attention from narrative and character development. The other connotation of spectacle is drawn from Guy Debord's book *The Society of the Spectacle*. Debord, a leading figure in the radical art/political group the Situationist International in the 1950s and 1960s, has been influential on both cyberculture and postmodernist thought. In a series of epigrammatic paragraphs *The Society of the Spectacle* asserts that postwar capitalism has reinforced its control over the masses through the transformation of culture as a whole into a commodity. Thus the spectacle is not so much a set of particular cultural or media events and images, but characterises the entire social world today as an illusion, a separation from, or masking of, real life:

Debord's spectacle is profoundly, though negatively, influential on Baudrillard's notion of simulation

> The spectacle is the moment when the commodity has attained the total occupation of social life. Not only is the relation to the commodity visible but it is all one sees: the world one sees is its world.
>
> (Debord 1983: 42)

This suspicion of the illusory potential of visual (especially photographic) images is evident in film theory. Because the photographic image, it is argued, captures the surface appearance of things, rather than underlying (and invisible) economic and social relationships, it is always, by its very nature, ideological. For example, in a lengthy footnote Comolli relates photographic realism in Hollywood (and bourgeois society as a whole) to gold, or money. Its illusions are those of commodity fetishism: [that] the photo is the money of the 'real' (of 'life') assures its convenient circulation and appropriation. Thereby, the photo is unanimously consecrated as general equivalent for, standard of, all 'realism': the cinematic image could not, without losing its 'power' (the power of its 'credibility'), align itself with the photographic norms. (Comolli 1980: 142).

But if these images are realism as illusion and artifice what do they tell us, if anything, of our 'real world' today? If we are sceptical about the ability of these, or any, images to speak the truth in any straightforward way, what might these images mean, what might they tell us (if anything) about our world (and their place within it)?

Special effects and hyperreality

The Mask (1994) is a good example of a film the form and popularity of which were predicated on its advanced use of computer-generated special effects. Special effects in films have often been regarded as at best distractions from, and at worst, deleterious to, the creative or artistic in cinema:

> *The Mask* underscores the shrinking importance of conventional story-telling in special-effects-minded movies, which are happy to overshadow quaint ideas about plot and character with flashy up-to-the-minute gimmickry.
>
> (Janet Maslin, *New York Times*, quoted in Klein 1998: 217)

Evident in genres preferred by the young – science fiction, horror, fantasy, action films – special effects-driven films are commonly seen as illusory, juvenile and superficial, diametrically opposed to more respectable aspects of popular film such as character psychology, subtleties of plot and *mise-en-scène*. They are often associated more with the technology, rather than the 'art' of cinema.

2.27 The Mask, 1994.

Claims that blockbuster films are symptomatic of, or are bringing about, the 'dumbing-down' of culture are a familiar feature of popular film criticism. These fears find a resonance in certain theoretical discourses on the relationships between digital and/or electronic technologies, popular culture and culture as a whole. In an essay in *Screen*, Michele Pierson identifies a fusion, in the work of critics such as Sobchack and Landon, of established pessimistic attitudes to spectacle in cinema with more recent 'cyberculture' discourses. Thus, it is argued,

> the popularization and pervasiveness of electronic technology has profoundly altered our spatial and temporal sense of the world. [Sobchack and Landon] agree that the hyperreal

> space of electronic simulation – whether it be the space of computergenerated special effects, video games, or virtual reality – is characterized by a new depthlessness.
>
> (Pierson 1999: 167)

We can identify, then, a set of overlapping discourses, all characterised by an idealist approach, some mourning the loss of 'earlier' realist aesthetics as 'meaningful', some celebrating developments in the technologies of verisimilitude. These discourses can be broken down as follows:

1 The forms and aesthetics of CGI are the latest in an evolutionary process of ever-increasing verisimilitude in visual culture; for example, regarding the dinosaurs in Jurassic Park as the technical perfection of the pioneering stop motion special effects of Willis O'Brien and Ray Harryhausen in films like *The Lost World* (1925) and *One Million Years BC* (1966).

2 A pessimistic version of 1, characterised by a suspicion of special effects and image manipulation as illusory, superficial and vulgar. The spectacular is posited as in binary opposition to the 'true' creative qualities of film as a medium. Here, the significance of digital effects lies not in any sense of virtuality *per se* but rather in their popular appeal (perceived as taking over 'traditional' cinema) and the technical virtuosity they bring.

3 A cybercultural perspective, from which this digitally generated verisimilitude marks a new, distinct phase in Western culture. 'Simulation' and the 'hyperreal' are key terms here; the computer modelling of '3-D', 'photo-realistic' environments and characters is seen as ontologically distinct from photographic representation.

4 An inversion of this cyberculture perspective, in which cinematic technology is symptomatic of technological change more generally, but which sees this change as one of a slide into digital illusion and depthlessness rather than the creation of new 'realities'.

Position 4 is evident in a number of postmodernist accounts of developments in media. For example, Andrew Darley (2000) places computer-generated special effects as an important cultural form within an emergent 'digital visual culture', alongside video games, pop videos, digital imaging in advertising and computer animation. Drawing on Jean Baudrillard and Fredric Jameson, he argues that these visual digital forms

> lack the symbolic depth and representational complexity of earlier forms, appearing by contrast to operate within a drastically reduced field of meaning. They are direct and one-dimensional, about little, other than their ability to commandeer the sight and the senses. Popular forms of diversion and amusement, these new technological entertainments are, perhaps, the clearest manifestation of the advance of the culture of the 'depthless image'.
>
> (Darley 2000: 76)

Key text: Andrew Darley, *Visual Digital Culture: surface play and spectacle in new media genres*, London: Routledge (2000)

In this account, mass culture is not yet entirely dominated by this 'neo-spectacle', but it occupies 'a significant aesthetic space . . . within mainstream visual culture', a space that is 'largely given over to surface play and the production of imagery that lacks traditional depth cues. Imagery that at the aesthetic level at least is only as deep as its quotations, star images and dazzling or thrilling effects' (Darley 2000: 124).

Though he establishes important precedents for, or continuities with, contemporary spectacular visual culture (early cinema, Hales's Tours, amusement parks, for example), this 'depthlessness' is new, the product of technological developments. Darley argues that there

is a qualitative difference from earlier, pre-digital effects: 'it is the digital element that is introducing an important new register of illusionist spectacle into such films' (Darley 2000: 107).

Critique of the depthless model: inverted idealism?

In the contemporary critique of 'meaningless', 'depthless' digital popular culture and its implication in the 'loss of the real', there is the implication, never fully spelt out, that it is exactly the characteristics of the classic realist text criticised by film theory (character psychology depth, narrative coherence, and so on) that embody the 'meaning' now lost in postmodernist digital culture. Classical realist narrative and photography, whilst perhaps not telling the truth, had 'meaning' and depth. The much-critiqued notion of photography's indexicality is resurrected (see for example Barbara Creed's discussion of the 'synthespian', Creed 2000, or Stephen Prince's notion of perceptual realism, Prince 1996). If any given 'realism' assumes and articulates its own particular model of the 'real world' then it is not surprising that in postmodernist theories the 'hyperrealism' of computer graphics has been interpreted not as presenting a more analogous image of the real world, but rather as heralding its disappearance.

A number of questions are raised for a materialist study of digital cinema:

- How new is neo-spectacle? While digital technologies clearly generate a great deal of interest and facilitate new, spectacular images, even new ways of making films, it isn't clear exactly what the distinction is between the 'second-order' realism of digitally produced special effects and, for example, the stop motion animation of Ray Harryhausen's famous skeleton army in *Jason and the Argonauts* (1963). Or, for that matter, the distinction between pre-digital and digital animation, neither of which rely on the photographic capture of external reality.
- Concomitantly, we could ask again the question posed throughout this book: in what ways are digital media themselves new? According to Baudrillard, for example, simulation has its roots in the Renaissance and contemporary hyperrealism had already arrived with television and other electronic media.
- What about the films themselves: are spectacular images necessarily meaningless? Action sequences and effects in films, along with song-and-dance numbers and the gendered visual pleasures of the display of bodies, are distinct from narrative – but is meaning only to be found in narrative and character?
- If films such as *Jurassic Park* and *Terminator 2* are evidence of an emergent postmodernist, do they escape the historical, economic and ideological contexts of earlier moments in cinema's history?

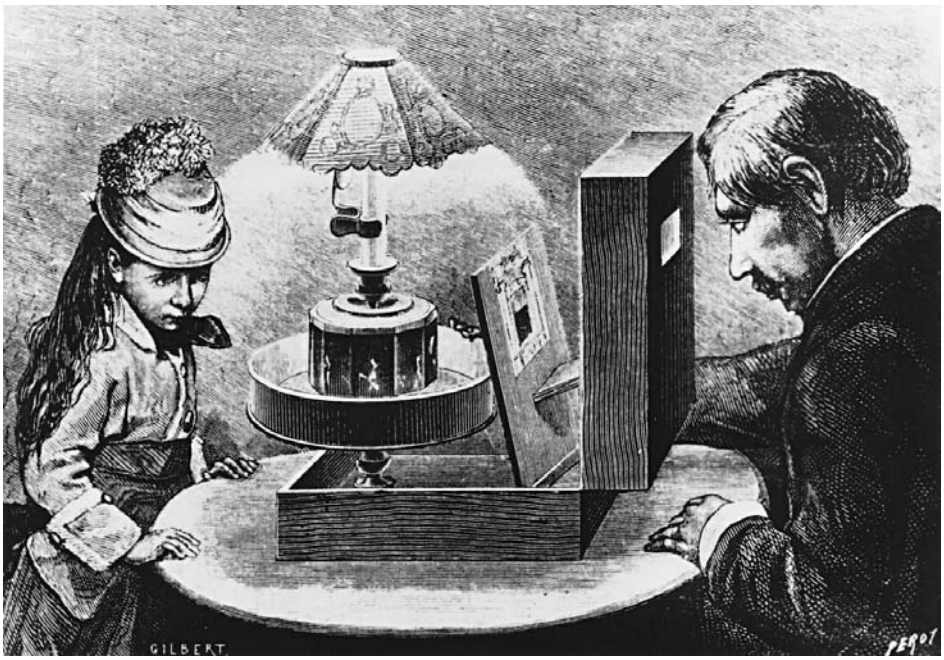
These last two points raise questions of audience – are the people who enjoy the spectacular realism of CGI merely dupes; seduced and exhilarated?

2.7.4 Thoroughly (post)modern Méliès, or the return of the repressed in digital cinema

> [D]igital media returns to us the repressed of cinema.
>
> (Manovich 1999: 192)

Critical studies of digital cinema often establish histories: either an implicit and more or less idealist history of technological evolution towards verisimilitude or immersion, or, more

interestingly, a discontinuous history in which early cinematic (and pre-cinematic) technologies return at the end of the twentieth century.



2.28 The Praxinoscope: pre-cinematic apparatus.

Early cinema to digital culture

> What happened with the invention of cinema? It was not sufficient that it be technically feasible, it was not sufficient that a camera, a projector, a strip of images be technically ready. Moreover, they were already there, more or less ready, more or less invented, a long time before the formal invention of the cinema, fifty years before Edison and the Lumière brothers. It was necessary that something else be constituted, that something else be formed: the cinema machine, which is not essentially the camera, the film, the apparatuses, the techniques.
>
> (Comolli 1980: 121–122)

Key text: Tom Gunning (1990a) 'The Cinema of Attractions: early film, its spectator and the avant-garde', in Thomas Elsaesser (ed.) *Early Cinema: space, frame, narrative*, London: BFI

As we have seen, this 'cinema machine' is the product of social and economic forces, drawing from the diverse range of photographic and other technologies for the presentation of moving images. Recent research into the early years of cinema has explored this 'cinema machine' as the reining in of early cinema's many competing technologies and modes of presentation and representation, undermining any notion that the emergence of the feature film was somehow inevitable, evolutionary (Gunning 1990a: 61).

See also **1.4** What kind of history?

Parallels are drawn between this 'radical heterogeneity' and the multifarious, yet interlinked, digital technologies today – technologies which operate across the boundaries between entertainment, art, science, governments and the military – seeming to offer an analogous cultural, historical and technological moment. A moment of flux in which future directions are up for grabs. Of course, unlike cinema, digital technologies emerge into a world

already familiar with a century's development of mass media. We have already seen how VR and CGI are being shaped discursively and actually by the codes and institutions of dominant entertainment media. On the other hand, this revisiting of cinema's 'prehistory' also highlights alternative cinematic forms that appeared to have fallen victim to the dominance of the feature film, but continued, marginalised, repressed or channelled into other media (and may now themselves be poised to take over). Animation is one such form, special effects are another, as we shall see.

Lev Manovich argues that with the advent of digital media we are seeing not so much the end of cinema as the end of cinema's privileged status as recorder of reality and the dominance of the fiction film (he calls this the 'super-genre', after the film theorist Christian Metz). At the end of the twentieth century, he argues, this super-genre is revealed as an 'isolated accident', a diversion from which cinema has now returned (Manovich 1999). The return of repressed alternatives to the super-genre displaces cinematic realism to being just the 'default option', one among many others.

This is one of Andrew Darley's key arguments – that digital visual culture, though 'new' in important ways, is at the same time continuous with a 'tradition' of spectacular entertainment that runs throughout the twentieth century (from vaudeville and 'trick' films at the turn of the century, through theme park rides, musicals to music video, CGI, IMAX, motion simulators, etc.), but with its origins much earlier in the magic lantern shows, phantasmagoria and dioramas of the eighteenth and nineteenth centuries. Some cultural theorists reach further back, to the seventeenth century, seeing the intricacy and illusionism of baroque art and architecture as prefiguring the forms and aesthetics of digital entertainment (Cubitt 1999; Klein 1998; Ndalianis 1999).

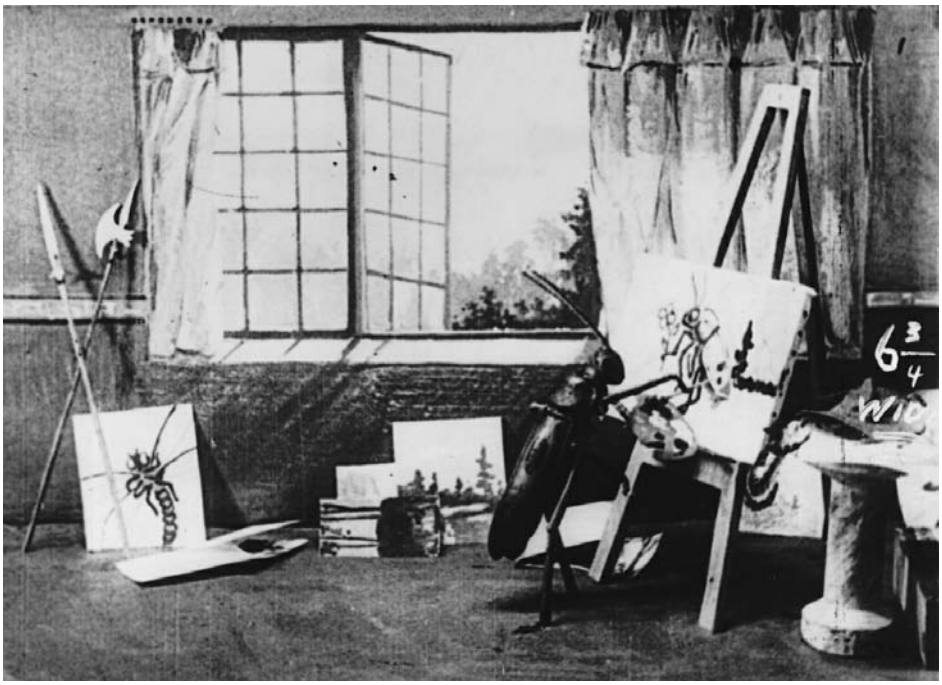
Despite their diversity all these forms share, it is argued, an invitation to their audiences to engage with the visual or kinaesthetic stimulation of these spectacles, and to be fascinated by their technical ingenuity, by entertainment technology itself as spectacle. The classic realist codes (character motivation and psychological depth, logical causality and narrative complexity), if present at all, function merely as devices to link together these dynamic sequences.

Animation, in both its popular and avant-garde contexts, has very often explored its own status as a form not predicated on the photographic analogue, revelling in the artificial, the fantastic, the illusionistic, or indeed its own apparatus

'Cinema of attractions'

The film historian and theorist Tom Gunning has established the year 1906 as pivotal to the establishment of narrative cinema. Before then narrative, where it had existed, was used very differently, primarily as a pretext for sequences of tricks, effects or 'attractions'. The films of George Méliès are paradigmatic here. Méliès' career began in fairground magic and illusionism, and his innovations in cinema continued this non-realist mode. His studio, Méliès said, 'was the coming together of a gigantic photographic studio and a theatrical stage' (Méliès 1897, in Comolli 1980: 130). The actualities films (records of trains entering stations, people disembarking from boats, etc.) of the Lumière brothers, though today more commonly regarded as pioneering a documentary – rather than spectacular – realism, are included by Gunning in this 'cinema of attractions'. Ian Christie points out that the first presentations of the Lumière projector began with a still image, which then 'magically' started to move. Similarly, films could be projected at varying speeds or even backwards (Christie 1994: 10). It was as much the spectacle of the cinematic technology and images in motion as the scenes and events depicted that drew the attention of audiences. This is evident in the fact that publicity for the films more often used the names of the projection machines, rather than the titles of the films. Films would often be presented as one item on a vaudeville bill, one attraction within the discontinuous sequence of sketches, songs and acts (Gunning 1990a).

The cinema of attractions was by no means entirely removed from the feature film. It persists as spectacle within narrative, whether sweeping landscape, show-stopping *femme fatale* or breathtaking stunts, emerging more forcefully in genres such as the musical (Gunning 1990a: 57)



2.29 Ladislav Starewicz, 'The Cameraman's Revenge', 1911.

2.30 Antz, 1998

> Theatrical display dominates over narrative absorption, emphasizing the direct stimulation of shock or surprise at the expense of unfolding a story or creating a diegetic universe. The cinema of attractions expends little energy creating characters with psychological motivations or individual personality . . . its energy moves outward towards an acknowledged spectator rather than inward towards the character-based situations essential to classical narrative.
>
> (Gunning 1990a: 59)

Thus, the 'realism' of the photographic capture of movement was not originally allied to the 'realism' of the classical realist text.

Rooted in magic and vaudeville, but also in a long tradition of scientific presentations and display. The spectacular possibilities of science, technology and magic run throughout the prehistory and history of cinema:

> although today's film technology may be transforming at a dramatic rate and is radically different from that of early cinema, its fundamental concern with constructing magical illusions out of the more rational and scientific realms associated with the technological remains similar.
>
> (Ndalianis 1999: 260)

This 'cinema of attractions' did not disappear after 1907, but continued in other moving image forms. Animation, for example, has remained a cinema of theatrical display and technical virtuosity. Thompson implies that cartoons, while marginalised and trivialised, were not repressed so much as positioned in a dialectical relationship with classical live action films. The anti-realist and disruptive potential of animated attractions, though tamed, sustain a sense of wonder in Hollywood films; 'they brought the mystery of movie technology to the fore, impressing people with the "magic" of cinema. Animation made cinema a perpetual novelty' (Thompson 1980: 111).

But what does it mean to identify these aesthetic and technical connections across the history of cinema? Critics like Bolter, Grusin and Darley have identified important areas of continuity and rupture within the technological development of visual culture, rejecting any utopian 'newness'. However, their histories are largely chronological or associative: questions of determination, beyond the immediate circumstances and characteristics of the media in question, are largely absent. We see, then, a critically productive set of analogies and continuities between the 'old' and the 'new' in cinema, but crucial questions of history and change remain. Without the explicit development of a materialist analysis of technological and cultural change we are left with either 'remediation' as an idealist logic of media themselves, or a postmodernist 'end of history' in which earlier cultural forms are reanimated, zombie-like, to dazzle, excite or terrify their audience into some sub-Baudrillardian ecstasy of communication.

If the dialectical relationship between dominant fictional film and the cinema of attractions is comparable with contemporary developments in digital visual culture, then the assumption within VR discourses of a disembodied experience – the rediscovery of the Cartesian divide – could be seen as analogous to the ideal audience of film in both popular and theoretical accounts (see Strain 1999). CGI, as the popular and vulgar repressed of VR, assumes, like its spectacular forebears, a nervous, sensual audience – we see the return of the body.

CASE STUDY 2.2 The digital cinema of attractions

2.31 Cyberworld 3-D. 2000 Imax Ltd.

The film *Cyberworld 3-D* (2000) is an encyclopaedia of the contemporary cinema of attractions: made for IMAX, and in 3-D, it immerses the spectator in visual excess and visceral kinaesthesia, and revels in the spectacular presentation of its own virtuosity. Images reach out from the vast screen as if to pull the polarised glasses from the face of the spectator, and recede back into a fantastically deep focus in which the eye is wrenched from impossible perspectives and pushed up against gleaming surfaces, animated characters, or, in one sequence, the gleefully rendered squalor of peeling paint and refuse.

It is a film made up of other films, linked by a VR conceit: a gallery of animated short films through which the spectator is guided by a computer-generated 'host' – a cross between Lara Croft and the avatar in the AOL advertisements (see **3.17**). The films within films range from a special episode of *The Simpsons*, to extended advertisements for the skills and services of software media houses and animation studios. Overall it is a commercialised vaudeville: a digital phantasmagoria of baroque fantasy, of generic promiscuity: science fiction, music video, fantasy, horror, whimsy, Victoriana, monsters, and chases.

2.7.5 Audiences and effects

What then are the implications of the fact that 'depthless' digital cinema has a history as well as a future? Does the shift to centre-stage of the cinema of attractions and animation reinforce or undermine discourses of postmodernist depthlessness? What does the 'acknowledged spectator' make of it all? Gunning's research highlights the active role the audience of the cinema of attractions plays in making sense of these spectacles, as well as the moral anxieties these attractions (and their audiences) provoked:

> The Russell Sage Survey [commissioned by a middle-class reform group in the 1910s] of popular entertainments found vaudeville 'depends upon an artificial rather than a natural human and developing interest, these acts having no necessary and as a rule, no actual

> connection'... A night at the variety theatre was like a ride on a streetcar or an active day in a crowded city . . . stimulating an unhealthy nervousness.
>
> (Gunning 1990a: 60)

Whatever these attractions mean, their significance does not lie solely in the 'artificial acts' themselves, but in their effect on the audience. This is not the ideal, non-specific and disembodied audience of 1970s film theory. This audience is addressed physically as much as intellectually, the 'nervous', embodied spectators experiencing kinaesthetic 'rides'.

Terry Lovell has questioned 1970s film theory precisely because of its assumption of naive audiences 'petrified' in their subject-positions. Lovell argued that audiences 'are . . . much more aware than conventionalist critics suppose, or than they themselves can articulate, of the rules which govern this type of representation' (Lovell 1980: 80). Notions of a depthless 'neo-spectacle', like earlier film theory, also assume popular cinematic forms to be dangerous (though perhaps distracting and superficial rather than ideological). Audiences may recognise the illusions, but there is no meaning beyond a play with expectations.

So, if the audiences for digital spectacular realism (or popular film in general for that matter) are not deluded or tricked, we could ask whether the notion of depthlessness is adequate to the analysis of popular understanding of, and pleasure in, special effects. Indeed a knowledge and appreciation of special effects as effects is a necessary part of the pleasure of spectatorship. The familiar notion of 'suspending disbelief' is not enough: the spectator is never completely immersed in or 'fooled' by the spectacle, and it is important that they are not – spectacular special effects are there to be noticed. There is then a play between the audience's willing acceptance of illusory events and images and their pleasure in recognising the sophistication of the artifice (see Darley 2000: 105). Here we are back with the notion of spectacular realism as simultaneously immediate and hypermediate. Without a sense of the immediate, the effects would lose their thrilling plausibility and 'reality effect', but the pleasure is equally in the implicit recognition of their hypermediacy – as technical wizardry or as an example of cuttingedge technology.

Michele Pierson has argued that this pleasurable awareness of cinematic artifice is key to the popular reception of special effects-driven blockbusters. Her analysis is historically located and sensitive to distinct categories of special effects. The late 1980s and early 1990s, then, were a 'golden age' for these films, films in which the main selling point and attraction was their innovative and spectacular use of computer-generated special effects. This period includes *The Abyss* (1989), *The Mask* (1994), *Terminator 2: Judgement Day* (1991). The release and theatrical presentations of these blockbusters were cultural events in their own right, centring on the presentation of digital spectacle as entertainment.

For Pierson the CGIs in these particular science fiction films both represent futuristic technology (for example the liquid robot in *Terminator 2*) and present themselves as cutting-edge technology (the CGI that rendered the liquid robot). The special effects in and of themselves marked 'the emergence of a popular, techno-futurist aesthetic that foregrounds the synthetic properties of electronic imagery' (Pierson 1999: 158). Science fiction special effects (or indeed, any 'cinema of attractions') could then be seen as a particular kind of realism: though they may represent the fantastical and the speculative, they present actual cinematic technological developments. In this context the terms 'presentation' and 'representation', as used by Gunning and Pierson, are roughly equivalent to Bolter and Grusin's 'hypermediacy' and 'immediacy'.

Key text: Michele Pierson, 'CGI effects in Hollywood science-fiction cinema 1989–95: the wonder years', *Screen* 40.2 (1999): 158–176

Pierson's study highlights the importance of not treating special effects as a homogeneous set of spectacular images, or indeed a teleological trajectory towards either

CASE STUDY 2.3: What is Bullet Time?

Audiences for CGI special-effects-driven films are also addressed through supplementary books, magazines and films, detailing 'The Making of . . .' the effects and spectacle, profiling key figures in the industry, offering explanations of how the effects were achieved, etc. In recent years, VHS and DVD releases of some such films have included documentaries on the making of the effects.

If in *The Matrix*, as in other special-effects-led films, the pleasures of viewing lie in the tension between immediacy and hypermediacy, then *What is Bullet Time?* (a short documentary included on *The Matrix* VHS and DVD [1999]) is positively orgiastic. It explains how the effects were achieved, and presents the stages of the construction of the illusion: from wireframe computer simulations of the positioning of cameras and actors, to actors suspended from wires against green screens bounded by a sweeping arc of still cameras, and so on through digital compositing and layering of backgrounds and the effects of bullets in flight.

The 'timeslice' technique (now much replicated, and parodied) is a striking example of parallels between the technologies of early and late cinema. A sweeping arc of cameras surround an actor suspended by wires, and simultaneously shoot a single frame. A movie camera at each end of the arc records motion up to and after the 'snapshots'. By editing all the single frames together the director can then generate the illusion of the freezing of movement and action – a frozen image around which the 'camera' appears to roam. The comparison with Eadweard Muybridge's experiments with sequences of still cameras to capture movement in the 1880s and 1890s is striking (see Coe 1992).

What is Bullet Time? carefully explains that to all intents and purposes the bullet time and timeslice sequences in *The Matrix* are animation. Indeed animation is needed 'inbetween' the extra frames to manipulate the timespan of slow motion scenes without losing clarity. We could add that the physical abilities of the film's protagonists are informed by animation's hyperrealist codes (the film was originally proposed as an animated film) fused with other spectacular forms, such as Hollywood action films and Hong Kong martial arts cinema.

We should be careful here to distinguish between postmodernist notions of simulation and the realist definition set out in 1.2.6. Photo-realist CGI is a good example of simulation: a copy without an original, it is artificial and yet as such it exists, and is experienced in, the real world. It is an addition to the real world, not a step away from it.

postmodernist simulation or verisimilitude. Special effects aesthetics and meanings are discontinuous and historically contingent. Each category of effects entails a specific relationship with the film's narrative on the one hand, and with its audience on the other. Indeed, we could begin to categorise the functions of distinct types of digital effects in films:

- Most Hollywood feature film production now features digital effects, but they are not always presented as such to the audience. Here, digital imaging is used to generate backdrops or climatic conditions that prove difficult or expensive to film conventionally.
- Some effects are designed not to simulate ostensibly normal events (or at least events not characterised by the supernatural or alien). An example here would be James Cameron's *Titanic* (1997). Effects were used to depict a real historical event, but still aimed to inspire awe in the technological spectacle.
- Special effects may play with other registers of filmic realism. For example, in *Forrest Gump* (1994), the protagonist is depicted meeting historical figures such as John Lennon and John F. Kennedy. The effects place Tom Hanks's character 'within' news footage of these figures. Here the technological trickery impacts on the documentary status of film.
- In *Who Framed Roger Rabbit* (1988) and *The Mask* (1994) the effects mark the irruption of other media (animation) as disruptive force. In fact the computer animation disrupts the form of these films, just as the animated characters disrupt the fictional worlds of the films.

We have seen that audiences respond to spectacular cinema as shared cultural event and as object of specialist 'fan' knowledges and practices. Steve Neale, in an essay on John Carpenter's remake of *The Thing* (1982), analyses the complex relays of signification between

the 'acknowledged spectator' and the film text itself. Drawing on work by Philip Brophy, Neale bases his argument on a specific line in the film. The line is uttered at the end of a scene characterised by a series of particularly gruesome and spectacular metamorphoses in which the 'thing' itself (an alien which assumes the appearance of its victims) eventually transforms into a spider-like creature, legs sprouting from a 'body' formed from the severed head of one of its human victims: 'As it "walks" out the door, a crew member says the line of the film: "You've got to be fucking kidding!"'(Brophy, quoted in Neale 1990: 160). As Neale summarises Brophy's argument, this line exists as an event within the diegesis of the film, but it is also an 'institutional' event,

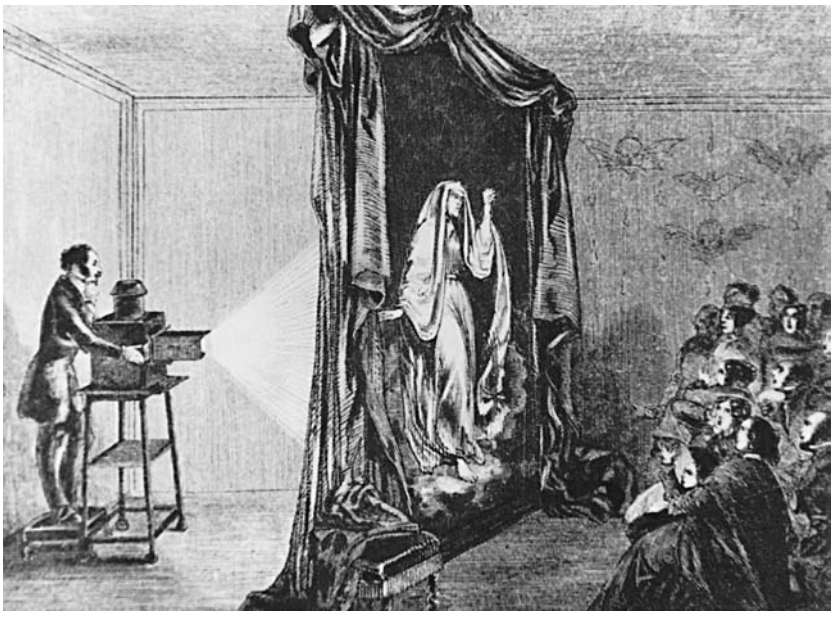
> a remark addressed to the spectator by the film, and by the cinematic apparatus, about the nature of its special effects. The scene, in its macabre excess, pushes the audience's acceptance of spectacular events within the codes of the science fiction–horror film beyond conventional limits, a transgression negotiated and accepted because of the film's ironic and reflexive acknowledgement of the transgression. Not only is the film 'violently self-conscious', but 'It is a sign also of an awareness on the part of the spectator (an awareness often marked at this point by laughter): the spectator knows that the Thing is a fiction, a collocation of special effects; and the spectator knows that the film knows too. Despite this awareness, the special effects have had an effect. The spectator has been, like the fictional character, astonished and horrified.
>
> (Neale 1990: 161–162)

The persistence of particular images and spectacles from pre-cinema to the contemporary cinema of attractions has been noted. We do not have the space to suggest why such images and figures resonate in popular culture, but refer the reader to some excellent work done in this field in recent years, particularly in terms of gender in popular genres. See for example Kuhn (1990), Creed (1993) on science fiction and horror, and Tasker (1993) on action films. Carol Clover (1992) has an exemplary discussion of slasher films and their audiences. Here, then, special effects are not 'meaningless', rather they often develop a complex relationship with the audience's expectations and pleasures.

Could this merely mean that the spectator has a sophisticated relationship with a meaningless text? Judith Williamson shares Lovell's assertion of the more epistemologically 'active' nature of popular audiences, as well as arguing that popular films themselves are neither meaningless nor exhaustively ideological. As popular products they must find resonances, however contradictory, with collectively felt sentiments:

> Popular films always address – however indirectly – wishes, fears and anxieties current in society at any given moment . . . Anyone interested in the fantasies and fears of our culture should pay close attention to successful films, for their success means precisely that they have touched on the fantasies and fears of a great many people.
>
> (Williamson 1993: 27)

As we have seen, Pierson argues that part of the pleasure of science fiction special effects of this period is that they not only represent the future, but are the future, or, at least, the most up-to-date technological developments. For her, 'techno-futurism' is progressive in that it encourages its audiences to imagine and speculate about possible futures. So popular spectacular genres are not necessarily empty of meaning; indeed the opposite could be argued. As Judith Williamson points out: 'Through use of genre conventions an apparently



2.32 and 2.33 Phantasmagoria to Resident Evil: body horror before and after cinema.

run-of-the-mill horror movie may speak eloquently about sexuality and the body, or a "second-rate" thriller articulate widespread fears about knowledge and secrecy' (Williamson 1993: 29).

Note: For histories of computer animation, see Allen (1998), Binkley (1993), Darley (1991), Manovich (1996)

Animation has never been entirely separated off from the 'super-genre' of the fictional feature film; most notably it has maintained its presence through the techniques of the production of special effects. Animation has provided a means of imaging that which cannot be conventionally photographed (for example, dinosaurs, from McCay to Harryhausen to Spielberg), and also functions, as we have said, as spectacular realism, simultaneously

CASE STUDY 2.4: Computer animation

If, as has been argued, cinema's presentation of its own technological (yet 'magical') attractions was channelled into animation, digital cinema welcomes this marginalised form back to the centre of moving image culture. Once prevalent assumptions that computer animation will achieve full photo-realism (generating characters and environments indistinguishable from those filmed conventionally) have been set back in recent years however. The materialist analysis of competing codes of verisimilitude is instructive here. For example, the *Toy Story* films made by Pixar (also a software developer) and Disney are characterised by a play between spectacular realism (sophisticated rendering of depth, lighting, texture, and so on) and cartoon-derived codes of character design, action, humour and movement. Indeed, it becomes evident that computer animation in *Toy Story* brings together Disney with the Disney hyperrealist aesthetics that have often been placed as the yardstick of digital spectacular realisms. Yet subsequent Disney/Pixar features such as *The Incredibles* and *Cars* have played up the graphic stylisation of animation's graphic heritage within photorealistic and 3-D-rendered environments. The first attempt at a fully photo-realist CGI feature, *Final Fantasy: the spirits within*, was a critical and commercial flop.

2.35 Monsters Inc.

Thus, the specific material limitations and characteristics of computer animation, and animation's centuries-long history of synthetic moving image making, help to determine the modes of spectacular realism developed today. On the one hand there are technical and economic obstacles to the digital rendering of complex textures and shapes. Toys, and the insects of *A Bug's Life* and *Antz*, because of their stylised shapes and generally smooth surfaces, suit the medium perfectly; organic, complex structures like human bodies and hair, or atmospheric effects do not. Hence the human characters in *Toy Story* ironically appear as cartoon-like, less 'realistic' than the toys themselves. Of course, toys also perfectly suit the industrial strategies and structures, the tried and tested language of children's moving image culture that established Disney as a global media conglomeration, generating new child-oriented characters for merchandising, licensing of images, new theme park attractions. When the Disney/Pixar feature *Monsters Inc*. was released particular attention was paid in its publicity material, and in sequences in the film itself, to the sophistication of the rendering of the monsters' fur: a reality effect celebrating new developments in computer imaging and processing power.

Key text: Norman M. Klein, 'Hybrid cinema: the mask, masques and Tex Avery', in Kevin S. Sandler (ed.) *Reading the Rabbit: explorations in Warner Bros. animation*, New Brunswick, N.J.: Rutgers University Press (1998), pp. 209–220

figuring magic, dreams and illusion in films, and fulfilling Hollywood's ideological need for a tamed presentation of technological 'magic' and illusion. What is new about contemporary developments in spectacular film is the increasingly sophisticated integration of animation and live action. This integration is not adequately described by the term 'remediation'; this is not so much the re-presenting of one medium by another as the emergence of a new hybrid cinema (Klein 1998).

Klein argues that *The Mask*, for example, not only makes direct references to the imagery of 1940s cartoons (in particular Tex Avery's *Red Hot Riding Hood* [1943]), but also draws closely on the form of this mode of animation: the extremely rapid editing and precision of timing developed in the chase cartoon. This type of cartoon timing is now widely used in conventional action scenes as well as in digital special effects. 'Today, essentially everyone working in special effects is expected to understand techniques from the chase cartoon. Knowing cartoon cycles and extremes helps the artist time an action sequence or splice in midaction: the offbeat aside, the wink to the audience' (Klein 1998: 210). We have already noted that the innovative special effects of *The Matrix* mark a fusion of live action cinematography and frame-by-frame manipulation that cannot easily be described as either live action or animation.

'Photorealism' may not be a fully adequate term here – see earlier sections on pictorial space – one of the features of *Toy Story* that captured audiences' imaginations in the mid-1990s was not only its sophisticated photorealist rendering of three-dimensional characters and their surface textures but also the capacity for these objects to move effortlessly through their three-dimensional environments from Andy's bedroom to pizza parlours, streets and vehicles. This is clear in this illustration from *Toy Story*'s precursor, Pixar's short film *Tin Toy* (1988): Images such as these are now the norm for mainstream animated films, but *Tin Toy* marked an early break from the various long-established aesthetic and economic strategies of animation, all of which (as we have seen) struggled with (or blithely rejected) the sheer time and effort in producing the impression of fully inhabited three-dimensional space. As we saw early in part 2, this aesthetic is rooted not only in cinematic photography but in the scopic regimes of the Renaissance of which photography is but one descendant.

Meanwhile some technically experimental but industrially mainstream films have more thoroughly woven together live action footage and pictorial conventions with the graphic possibilities afforded by digital postproduction. Richard Linklater's films *Waking Life* (2001) and *A Scanner Darkly* (2006) for example process live action footage with the kind of vector animation familiar from web-based Flash animation to produce films that play with ideas of reality both aesthetically and diegetically. Other recent examples of this extension to Klein's hybrid cinema include *300* (2006) and *Sin City* (2005), the latter explicitly remediating its comic book origins.

We could therefore invert Manovich's argument – that the live action feature film is only the default option in a wide spectrum of moving image forms – and argue that animation is the default option of cinema and moving images. Most computerised moving images are constructed by graphic manipulation rather than cinematographic recording, by default animation as 'frame by frame manipulation'. So, if we look beyond the theatrical film and to moving image culture at large, new animated forms predominate, developing through the material possibilities and restrictions of digital technologies and networks.

2.36 Waking Life, 2001

2.37 Sin City, 2205

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