As photographer Richard Nicholson has recently remarked, ‘Even a few years ago every profession had its own machinery, its tools; now we all have computers.’ The digital shift has fundamentally revolutionized animation from such progress, this has seen the analogue become a marker of some past era of technologies and techniques. There is some irony, then, that animation has benefited from the digital era bringing its definition into question but, as a consequence, reclaiming it from the margins of artistic practice, and placing its significance right back at the heart of debates and discourses about moving-image production and cinema itself.

In The Language of New Media, Lev Manovich makes the following observation:

Once the cinema was stabilized as a technology, it cut all references to its origins in magic. Everything that characterized moving pictures before the twentieth century – the manual construction of images, loop actions, the discrete nature of space and movement – was delegated to cinema’s bastard relative, its supplement and shadow – animation. Twentieth-century animation became a depository for nineteenth-century moving image techniques left behind by cinema.2

These same moving-image techniques have become what animator Don Hertzfeldt has called the ‘toolbox’, to which animation (despite the crisis at the Walt Disney Company when it temporarily closed its classical animation division in response to what appeared to be the hegemony of CGI) constantly refers, and uses.3 In turn, this toolbox of techniques and approaches maintains animation’s status as the most progressive and experimental of the various forms of moving image, both at the margins and in the mainstream.

It is pertinent, then, to look at animation through one hundred objects, tools and technologies, many of which are present in the Watch Me Move exhibition – and are indicated throughout the following text in BOLD. As the world is increasingly mediated through screens and keyboards, and as virtual environments prevail, the seemingly lost world of the material past takes on an increasing fascination, especially in the ways in which the physical elements of previous processes and practices have been re-mediated in the contemporary era. Essentially, the history and definition of animation have been rewritten through the objects, applications and mechanisms that it employs, and these are traced here.

Object number one is Charles-Émile Reynaud’s THEÂTRE OPTIQUE of 1888. The first device capable of presenting moving images to an audience, it made its public debut in 1892 during a show given by Reynaud in Paris. Preceding the public premiere of the Lumière brothers’ first film by three years, Reynaud’s show, billed as Pantomime lumineuses, featured three early CARTOONS, Pauvre Pierrot, Un bon bœuf and Le Clown et ses chiens, displayed using a device that was a sophisticated development of Reynaud’s own praxinoscope. The Théâtre Optique projected more than 500 individually painted sequential images embedded within a leather band; each narrative was accompanied by a piano piece. Reynaud’s use of technology demonstrates the preoccupation of the cinema pioneers with self-consciously presenting both the mechanism and its creative outcomes simultaneously. A condition that has existed in animated film throughout its history. When Georges Méliès developed optical tricks in his early cinematic work, an
sometimes employed stop-motion animation, animation as a form in its own right developed in other hands.

In 1899, using MATCHES, Briton Arthur Melbourne-Cooper created stick-figure stop-motion puppets for such films as Matches Appeal, Animated Matches Playing Volleyball and Animated Matches Playing Cricket. Melbourne-Cooper's experience as a newsreel cameraman and particular interest in sport inspired him to engage with movement for its own sake. He rejected the moving corporeal body, already the key fascination of the early cinema, replacing it with a more comic representation of the body as it played out deliberately choreographed motion. The Spaniard Segundo de Chomón took this to its logical and often surreal extreme in a body of work made between 1905 and 1912 in Paris, which partly echoes the approach of Méliès, and also anticipates the playfulness of such film-makers as Charles Bowers.

This playfulness also featured on Anglo-American J. Stuart Blackton's chalkboard, common to many live performances given by LIGHTNING SKETCH artists across Europe and the United States at the turn of the century. In theatrical settings, artists would rapidly draw amusing and topical caricatures on a blackboard or large paper pad. In the context of early film, this process was recorded and made yet quicker through frame-by-frame editorial intervention: figures and forms would magically emerge on screen as animations, the blank background suddenly revealing its graphic images. Blackton's The Enchanted Drawing (1900) and Humorous Phases of Funny Faces (1906) both included stop-motion chalk-drawn illusions, and prompted him to use more extensive stop-motion effects in The Haunted House (1907). This was the film that essentially convinced US film culture that animation might be a further verification of both early cinema's possibilities and its popularity.

In St Petersburg, however, the development of Hollywood cinema was the least of the concerns of Alexander Shiryaev, Deputy Ballet Master of the Mariinsky Theatre. Shiryaev's early interest in cinematography, as well as his desire to preserve the fast-disappearing national folk dances of Russia, led him to draw and animate on rolls of PAPER in 1905, and to make 3D stop-motion PUPPET versions of character choreography in 1906. In France, Émile Cohl — protégé of political caricaturist André Gill and member of the “incoherent” movement — drew the first acknowledged cartoons on paper for Gaumont. Fantasmagorie (1908), a surreal sequence of transforming images, illustrated the narrative potential in metamorphosis, and cited the ephemeral image-making of the ‘fantasmograph’ of the 1850s. Like Blackton's Humorous Phases of Funny Faces, Cohl's film featured a clown, and presented the figure of the animator as the creator of the work. The very illusionism of animation always suggests the presence of such an author, even if not literally in the frame, and equally points up the degrees of constructed-ness in the image. Thus every animation, even from its earliest conception, also plays formally with time and space.

This was of major concern to American illustrator and comic-strip artist Winsor McCay, whose observation of a DINOSAUR SKELETON led to the creation of Gertie the Dinosaur (1914). Gertie was a playful character who hurled mammoths into the far distance and ‘interacted’ with McCay in his vaudeville-style shows and lectures. As well as anticipating both gaming interaction and tensions between 2D and 3D space in later cartoons, Gertie also prefigured and
incomplete technology, invest in it, and market it as the CINEPHONE
SYSTEM. Powers was able to persuade Walt Disney to use the
system on his first sound cartoon, Steamboat Willie (1928), featuring
the later-iconic Mickey Mouse. This promoted the SYNCHRONICITY
of Carl Stalling’s soundtrack, and led to the use of fragments of sound,
song and music to add a distinctive narrative, emotional and comic
dimension to a cartoon. The Fleischer brothers’ later Talkartoons
shorts (1929–32) embraced full SCRIPTED DIALOGUE, and
made Betty Boop a flirtatious, innuendo-inflected star. Their key
innovations, however, proved to be the Rotoscope (1914) and the
STEREOPTICAL PROCESS AND APPARATUS (1933). The rotoscope
allowed animators to trace over live-action figure motion, and was
used, for example, for the dance-walking, ghost-styled figure of
orchestra leader and singer Cab Calloway in the Fleischers’ Snow
White (1933). It was later adapted by Bob Sabiston for his ROTOSHOP
software, and used in Richard Linklater’s Waking Life (2001). The
stereoptical apparatus, essentially a large turntable, was designed
to create depth in the environment of a 2D cartoon, and, like the
rotoscope – surprisingly, perhaps, given the Fleischers’ surreal
story constructions and the full animation of many aspects of their
mise en scène – sought to respect the theatrical proscenium and codes
of realist representation.

Ironically, the Fleischers had already challenged the material
fixity of the real world in the animated figure of Koko the Clown, who,
in the Out of the Inkwell series (1918–29), leaves his animated world to
cause havoc in the studio environment, a perspective Disney reversed by
placing a live-action ALICE in an animated ‘wonderland’ (1924–27).
Disney recognized, however, that such graphic freedoms and comic
vignettes – epitomized by Otto Messmer’s extremely popular and
Chaplin-influenced Felix the Cat cartoons (1919–28) – could service the
cartoon form only to a limited extent. They did not facilitate animation
in an extended narrative or, indeed, as art. Disney thus used its
technological innovations to move towards a hyperrealism, one that
authenticated the conviction and believability of the cartoon
environment itself. This also enhanced the appeal and authority of the
characters, even in the light of their over-determined theatricality and
the prominence of slapstick and physical comedy. To this end, Disney
was more successful than the Fleischers, creating a ‘reality’ in the
cartoon, which allowed for both broad humour and more emotive,
sentimental expression.

The Disney studios embraced LIFE-DRAWING and developed
the use of STORYBOARDS in order to advance visual storytelling, and
to prepare what needed to be animated and shot. It invested in the
TECHNICOLOR process for Flowers and Trees (1932), even though part
of the film had already been made in black and white, and it deployed
(William) GARRITY AND (Roger) BROGGIE’S MULTIPLANE
CAMERA for The Old Mill (1937). Consisting of a camera positioned
above five separate planes of glass, each one holding a different
element of the animated scene, this device allowed animators to create
a greater sense of depth by ‘moving’ the camera between each plane.
The first and second were used for animation in the foreground, the
third and fourth for backgrounds, and the fifth mainly for sky and
distant landscape; four of the planes could also be moved laterally. Ub
Iwerks, the extraordinary draughtsman responsible for the style of early
Disney cartoons, was the technical genius behind the XEROGRAPHIC
FUSING/DEVELOPING APPARATUS for inking cels, later used in
the making of One Hundred and One Dalmatians (1961). He also
developed the SODIUM TRAVELLING-MATTE PROCESS, which
helped to fuse live action and animation more effectively, but his early
experiments were with the multiplane camera. However, it was the
sophistication of Garrity and Broggie’s version of the camera, together
with its ability to represent shifting depth perspective and figures
apparently moving through receding and foregrounded space, that
was crucial in persuading Disney that an animated film could be made
at feature length and echo live-action narratives. The milestone of
Snow White and the Seven Dwarfs followed in 1937, ensuring
animation’s recognition as both a headlining and a mainstream form
of entertainment.

Inevitably, the success of Disney, even in the contemporary era,
tends to obscure the achievements in animation elsewhere. The studio’s
Silly Symphonies of the 1930s were essentially a set of experimental
films leading to the creation of Snow White, similar in nature to the
Pixar shorts of the 1980s and 1990s that led to Toy Story (1995).
However, the Silly Symphonies ran parallel to a different kind of
experimental tradition in Europe, one that has left behind its own
Pirotian objects: Lotte Reiniger’s exquisite CUT-OUTS from her
silhouette film The Adventures of Prince Achmed (1926), which is
preceded as the world’s first known animated feature only by Quirino
Cristiani’s El apóstol (1917); Alexandre Alexeieff and Claire Parker’s
PINSCREEN, which rendered engraving-like images through the
shifting tones of layered pins set at different heights in such films as
Night on Bald Mountain (1933); and Oskar Fischinger’s stop-motion
MARCHING CIGARETTES from the advertisement Muratti Marches
On (1934). Inspired by German film director Walter Ruttmann, as well

as by his own desire to create ‘visual music’, Fischinger developed
a WAX-SLICING MACHINE, which synchronized the slicing of a
cylinder composed of melted and hardened multicoloured wax with
the shutter on a camera; the resulting frame-by-frame record of the
randomly swirling colours and forms present in the cylinder could
then be turned into an animated sequence. Fischinger continued
to experiment with colour, shape and form, creating an abstract
masterpiece, Composition in Blue (1935). His formalist preoccupations
were echoed by Norman McLaren, who noted in a series of VISUAL
SCRIPTS the technical and aesthetic considerations of his approach.
McLaren employed a number of optical effects, including PIXILATION,
the frame-by-frame recording of staged physical actions, which he used
to particular effect in his brutal anti-war parable, Neighbours (1952). He
also used an OPTICAL PRINTER—a device for re-photographing strips
of film—to achieve an almost stroboscopic effect in Gas de deux (1958),
a study of ballet dancers Margaret Mercier and Vincent Warren played
out in stark lighting with lyrical precision.

Since its early days, animation has been characterized by the
simultaneous development and consolidation of the ‘cartoon’ and
a more ‘experimental’ tradition, essentially preoccupied with the
manipulation of materials, space and time in the communication of
emotion. However, at the heart of many creative solutions remain
technical solutions. In the early 1930s Hungarian-born George Pal used
REPLACEMENT HEADS for his 3D characters in order to address
the labour-intensive aspect of the animation process; as early as 1912,
in the dark, fairy-tale world of The Cameraman’s Revenge. Polish-
Lithuanian animator Ladišlas Starewitch used INSECTS as 3D
characters; and in 1916, in Japan, Oten Shimokawa, failing to animate
chalk drawings, drew directly on to film using ink. Shimokawa's INK POT anticipated not only the Fleischers' inkwell but also, more importantly, Len Lye's use of a PAINTBRUSH and FILM STOCK as he worked in a more self-consciously personal style on such vibrant abstract films as A Colour Box (1935). This more direct, 'under the camera' style was extended by Caroline Leaf in her under-lit SAND-ON-GLASS film The Owl Who Married a Goose: An Eskimo Legend (1974); her PAINT-ON-GLASS film The Street (1976); and her SCRATCHED-ON-FILM drama Two Sisters (1990), in which the means to make the film are reflected in its themes of light and dark, hidden and revealed, controlled and controlling - and, arguably, the generic qualities and conditions of the animator.

So often, then, the talent emerges through its tools and processes: the PENCILS of Joanna Quinn, Bill Plympton and Frédéric Back, the POSTCARDS decorated by Robert Breer, the SCRATCHED PLASTER of Piotr Dumasia, the myriad OBJECTS that have had their voices and histories revealed by Jan Švankmajer; the DETRITUS reanimated by the Brothers Quay; Jiří Trnka's puppets, esteemed as ACTORS, rather than merely material things; Nick Park's mute but gesture-rich CLAY dog, Gromit; Karel Zeman's assorted MINIATURE AIRSHIPS; Terry Gilliam's STOLEN FOOT from Agnolo Bronzino's Venus, Cupid, Folly and Time; Yuri Norstein's and Andrey Khrzianovsky's challenging personal, religious and political ICONS; Bob Godfrey's FELT-TIP PENS, Vera Neubauer's KNITTING WOOL figures, Viking Eggeling's SCROLLS, Zbigniew Rybczyński's MULTIPLE MATTE MANIPULATIONS (a matte being a mask used to obscure one part of an image so that another can be put in its place) in Tango (1980); or Bentroid Bartosen's diffusive LIGHT SOURCES in the never-released L'idée (1934). But what are these but a means to draw on and represent memory; the 'muscles and bones' of physical expression; the fantasy, dream and solipsistic preoccupation of interior states recalled?

Animation is effectively one long expression of recollection and response, a re-interrogation and representation of alternative realities and preferred worlds. For example, even as Disney had lyricized animation and perfected its enclosed pastoral idyll with quasi-gothic undercurrents - a radical perspective and approach in the eyes of Soviet film-maker Sergei Eisenstein - the emergent auteurs of TERMITE TERRACE (the Warner Bros. studio), Tex Avery, Chuck Jones, Bob Clampett and Frank Tashlin, were reinventing the cartoon, constantly breaking the cherished FOURTH WALL, sharing the illusion with the audience. This spirit of reinvention and acknowledgement of the audience have been characterized by a persistent interrogation of the language of expression animation permits. From the use of GRAPHIC DESIGN idioms by United Productions of America (UPA) and Halas & Batchelor's use of MODERN ART codes and conventions, as well as TENSION SHEETS planning the emotional development of the story in relation to its aesthetic shifts, to the War brothers' CALLIGRAPHIC approach and Pict Pàrn's profoundly influential CARICATURES, conventional notions of the cartoon have always been challenged.

In Zagreb, between 1956 and 1970, the artists of the former Yugoslavia deployed LIMITED ANIMATION. In the made-for-television era in the United States, largely defined by Hanna-Barbera, this was known as REDUCED ANIMATION. In Japan, it was pejoratively called 'overexpressionism' by Hayao Miyazaki. Each approach used less full animation, focused on many rapidly cut single shots and REPEATED MOVEMENT CYCLES, and privileged minimum
sound and imagery to gain maximum symbolic suggestion. In Zagreb
this achieved a model of political metaphor resistant to authoritarian
oppression; in the United States it foregrounded the work of such
talented VOICE ARTISTS as Dawg Butler and June Foray, and in Japan
it prompted Studio Ghibli to maintain its powerful model of emotive
storytelling in the face of MERCHANDISE and such GAMING-related
phenomena as Pokémon (1997–present). The relationship between
animation and the commercial marketplace is a well-established
one, of course, producing a myriad of artefacts, among them the
3D MOVING ADVERTISEMENT in London’s Piccadilly Circus
featuring George Studdy’s Bonzo the dog (1925); MICKEY MOUSE
DOLLS, Popeye’s SPINACH, and the Transformers TOYS. Cels,
storyboards, LAYOUTS, MODEL SHEETS (on which a single character
is depicted from a range of angles and perspectives), DEVELOPMENT
SKETCHES and even SETS have in themselves become animation art
and, like the spin-off products, highly collectable – a facet of animation
culture explored to brilliant effect in the narrative of Toy Story 2 (1999).
Perhaps one of the most important collectables from the history of
animation, however, is Ed Catmull’s SIGGRAPH PAPERS, academic
discourses that were instrumental in the development of computer
animation. In 1986, together with Alvy Ray Smith from Industrial Light
and Magic (ILM), ex-Disney animator John Lasseter and Apple’s Steve
Jobs, Catmull formed Pixar Animation Studios, a company committed
to making fully computer-generated animated films. George Lucas
did not want to invest in this possibility, focusing instead on animated
digital effects for his Star Wars series (1977–2005).11 Thereafter,
Hollywood increasingly prioritized the use of animation in its post-
production suites, creating DIGITAL DOUBLES, CROWD

SIMULATIONS, SCENE EXTENSIONS and 3D ENVIRONMENTS,
while also using MOTION CAPTURE to deploy physical performances
by actors, dancers and martial-arts experts in the service of animated
characters. If Roger Rabbit shared a 2½D space with human
characters in Who Framed Roger Rabbit (1988), and the eponymous
hero of Tarzan (1999) swung through a jungle created using DEEP
CANVAS (a means of rendering 3D environments for 2D animation),
then Gollum fully shared 3D space in Lord of the Rings: The Two Towers
(2002). The development of the Na’vi for James Cameron’s Avatar
(2009) was informed by the use of REAL-TIME MOTION CAPTURE
technology, and proved the most advanced use of immersive
POLARIZED 3D. Such worlds are our worlds.

So all we have now are computers. The LIGHT CYCLES from
Toon (1982), the STAINED-GLASS KNIGHT from Young Sherlock
Holmes (1985), Toy Story’s VIRTUAL PULL-STRING COWBOY AND
ASTRONAUT, the DIGITAL HAIR AND CLOTH from The Incredibles
(2004) – all gathering dust in a DATABASE, the new museum space,
the store for exhibition.

But animation has always insisted that when it has nothing
left, it has something more. As Canadian Rose Bond projects moving
images on to town-hall windows, or Italian artist Blu moves subjects on
walls, or American film director and animator PES reimagines old objects
to exhibit on the Internet, the world is refreshed and re-imagined.

Animation always bellows, ‘Watch me move!’
OSKAR FISCHINGER
Dynamics, 1942
35mm, colour, silent, 4 min.
© Fischinger Trust, courtesy of Center for
Visual Music

RIGHT
NICK PARK AND STEVE BOX
Set from the film Wallace & Gromit
in The Curse of the Were-Rabbit, 2005
Wallace & Gromit Curse of the Were-Rabbit
© 2005 Aardman Animations Ltd

1 See Richard Nicholson, quoted in
Sean O'Hagan, 'Elegy to the Ghost
in the Machine', The Observer,
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2 Lev Manovich, The Language of
New Media, Cambridge, Mass., and

3 Paul Wells and Johnny Hardstaff,
Re-imagining Animation: The
Changing Face of the Moving Image,
Lausanne (AVA Academia) 2008, p. 60.

4 See Tijntje De Vries and Ati Mul,
'They Thought It Was a Marvel':
Arthur Melbourne-Cooper (1874–
1961) – Pioneer of Puppet Animation,
Amsterdam (Pallas) 2009.

5 See Birgit Beumers et al., eds,
Alexander Shvartsman: Master of
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del Cinema Muto) 2009.

6 See Donald Crafton, Émile Cohl,
Carricature and Film, Princeton, NJ

7 See J.P. Telotte, Animating Space:
From Mickey to WALL-E, Lexington,
Ky (The University Press of Kentucky)
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8 See Leslie Iwerks and John
Kenworthy, The Hand Behind the
Mouse, New York (Disney Editions)

9 See Jay Leyda, ed., Eisenstein on

10 Hayao Miyazaki, Starting Point:
1979–1996, tr. Frederick L. Schodt
and Beth Cary, San Francisco (Viz
Media) 2009.

11 See Michael Rubin, Droidmaker:
George Lucas and the Digital
Revolution, Gainesville, Fla. (Triad)
2006.