

BITS IN MOTION :

Early British
Computer-Generated
Art Film

A programme for the NFT of films made by
British pioneers of computer animation

Programme Notes
7 March 2006

[INTRODUCTION]

The earliest computer animators had no off-the-shelf software packages, no online tutorials and nothing to buy in a bookshop on how to make animated films using computers. When they began to experiment with computer-generated imagery, they had to gain access to rare and specialised mainframes and learn programming from the ground up. As pioneers, they were making the first steps towards the highly successful CGI animations of the 21st century. The practitioners in this survey were among those who forged alliances with scientists and institutions, learned to write code, built or customised their own hardware where necessary and discovered imaginative ways to bend the available technology to suit their creative requirements. Working with equipment designed for completely different purposes was a difficult task requiring long hours, dedication and a particular type of mind-set but it led to highly productive cross-disciplinary working relationships. These films remain important examples of the collaboration possible between artists and technologists in this period. The CACHE Project has rediscovered some of the very first efforts in this medium and this event, supported by the London Centre for Arts and Cultural Enterprises, hopes to make its origins better known.

// Recently completed in the School of History of Art, Film & Visual Media at Birkbeck, University of London, the CACHE (Computer Arts, Contexts, Histories, etc) Project was supported by the Arts and Humanities Research Council and traced the inception, growth and development of British computer arts from its origins in the 1960s to the beginning of the 1980s (www.bbk.ac.uk/hosted/cache). An open access on-line database of archive material relating to this early activity has been created with the generous support of System Simulation Limited and is hosted by the Arts and Humanities Data Service (www.ahds.ac.uk/visualarts/). The book, *White Heat and Cold Logic: British Computer Arts 1960-1980*, edited by Dr Charlie Gere, Paul Brown, Dr Nick Lambert and Catherine Mason is forthcoming from the MIT Press.

// This event is held in conjunction with the Computer Arts Society, originally founded in 1969, of which many of the practitioners featured were members (www.computer-arts-society.org).

// We wish to thank the British Film Institute for assistance with organisation and the NFT for hosting this screening, as well as the artists for kindly sharing their work and their time with us tonight.

Catherine Mason

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[SECTION ONE : BEGINNINGS]

Due to the expensive and specialist nature of the equipment involved, this period was dominated by issues of access. The Atlas Computer Laboratory in Oxfordshire (established in 1961 by the UK Atomic Energy Authority) was to play a crucial role in the development of animation in the UK. Named after the largest of the three British built Ferranti Atlas I computers – one of the fastest and most innovative computers available world-wide – the Lab provided academic and government research workers computing services on a scale that they could not get from their own institutions. Largely due to the efforts of Bob Hopgood, the Associate Director for Computing, the Lab became involved with computer animation around 1963, producing scientific visualisations and educational material. The Lab's microfilm recorder the SC-4020 and later the FR 80 (a cathode ray tube enclosed with a computer controlled camera), allowed the production of animated films as by coincidence the film used for microfilm records is identical to 16mm movie film. This became one of the most common ways of making computer animation in this pioneering period, with the Lab, 'the spiritual home of the craft in Britain' according to the *Financial Times* (10/08/71).

// This section outlines artists' use of mainframes for animation purposes and demonstrates the range of aesthetic effects possible. It is introduced by Malcolm Le Grice, filmmaking artist and Emeritus Professor at Central Saint Martins College of Art and Design, University of the Arts London.

01 THE FLEXIPEDE

- > Tony Pritchett (1967)
- > Sound 2 minutes
- > Courtesy the artist

The *Flexipede*, a humorous account of a fanciful creature, is the first fully surviving work of computer animation created in Britain. Pritchett commenced his career as a computer programmer and worked at the BBC in the mid-1960s on educational programmes about mathematics and computing. His interest in the field of computer animation was encouraged by reading about American pioneers including Ken Knowlton and Stan Vanderbeek. This film was made by Pritchett as a researcher at the Institute of Computer Science, part of London University's Computer Service, which also had an Atlas mainframe. Using the computer's unique language – Autocode, it took him six months to produce and output onto 16mm film using the microfilm recorder located at the Culham Laboratory (then part of the UK Atomic

Energy Authority). The sound track consists of "found sounds". Pritchett admired the creativity and originality of the found sounds being produced at the time by the BBC Radiophonic Workshop (responsible for, among others, the arrangement of the *Dr Who* theme tune in 1963). In *Flexipede*, the sounds were located and taped by the artist using a portable microphone and include a creaking office chair, a jew's harp and the sound (the creature's jaw opening at the end) of a garage hoist. The "gulp" at the finish is Pritchett himself swallowing. The use of found sounds during this period created an output greater than the technology available. Their unusual quality seemed to speak of the modern technological age and could even suggest a futuristic atmosphere. *Flexipede* was first shown publicly at *Cybernetic Serendipity* at the ICA in 1968. It toured the Netherlands as part of *Computer Grafiek* (1970), a show including films by Whitney, Lillian Schwartz and William Fetter. Later, Pritchett produced animations for the Open University and the BBC and collaborated on projects with Colin Emmett, Alan Kitching, Stan Hayward and others.

02 Clip from THRESHOLD (incorporating YOUR LIPS I, 1970)

- > Malcolm Le Grice (1972)
- > Colour Sound 5 minutes
- > Courtesy the artist
 - > Threshold is normally performed live by the artist, for
 - > *Bits in Motion*, the artist has created a special
 - > presentation on DVD

A Slade School of art trained painter, Le Grice turned to film in the mid-1960s and first learned to write Fortran code whilst collaborating with Alan Sutcliffe on a performative work entitled *Typodrama*, for the Computer Art Society's first exhibition *Event One* at the Royal College of Art in 1969. His early interest in multi-media events incorporating film and performance remain an important part of his work to date. Le Grice was among one of the first artists in industry, receiving a grant from the Science Research Council to work at the Atlas Lab. Over a period of nine months, he produced black and white footage of eight seconds entitled, *Your Lips I* (1970), a pun on the ellipse shape which echoes a mouth. Though he recently admitted, 'The ratio between effort, time and product was on a scale between idiotic and completely crazy', he was able to transform this footage into usable material and colour it at the London Filmmakers Cooperative. It was incorporated into two subsequent films: superimposed with military images in *Reign of the Vampire*, and as a section of the film series *How to Screw the CIA, or How to Screw the CIA?*, about military hovercraft, both in 1970. Reminiscent of a gun sight, the

ellipse was an ironic reference to the paradox the artist saw in producing the material using the Atomic Energy Authority's equipment. It appears again, superimposed with other images in *Threshold*. Le Grice was involved with touring exhibitions of American computer animation throughout Europe, wrote for *Studio International* during this period and published an article about computer films in *Time Out*, (issue 98, 1971-2). He has recently published a book *Experimental Cinema in the Digital Age* through the BFI.

03 SQUARE (See colour plate, overleaf)

> Stan Hayward & George Borzyskowski (1972)

> Colour 1 minute

> Courtesy the artists

This film also acted as a promotion for The Computer Studio, based on the company's logo, a spiralling square designed as a tessellated pattern. Stan Hayward commenced his career as a scriptwriter and also worked in traditional animation at the famous Halas & Batchelor studio in the late 1950s and 60s. Inspired by the Whitney Brothers' films seen on a visit to New York, Hayward was one of the first to realise the possibility of building an animation studio around the computer to include all aspects – Creative, Production, Management and Technical. Hayward formed The Computer Studio with Dr Colin Besant and Alan Jebb of the Nuclear Power department at Imperial College, and set up in Soho. Besant and Jebb had developed the CADMAC system, consisting of a D-Mac (Digitising Machine), operating from a PDP-8. The D-Mac combined digitiser and A0 pen plotter with a glass lid, and being a flatbed, allowed the user to draw or trace over onto animation cel with a "puck", a primitive mouse with a cross-hair lens. (See colour plate) Experimental filmmaker and graduate of Central School of Art in London, George Borzyskowski used the CADMAC system for *Square*. The line images were plotted over many hours using a Rotring technical pen with black ink mounted into the plotter onto cells. The cells were then filmed on a rostrum camera resulting in four b/w 35mm neg films, one for each of the final colours – these were then optically combined by a film lab resulting in the final 35mm colour film. *Square* was first screened publicly at a festival in Lisbon, Portugal in 1973.

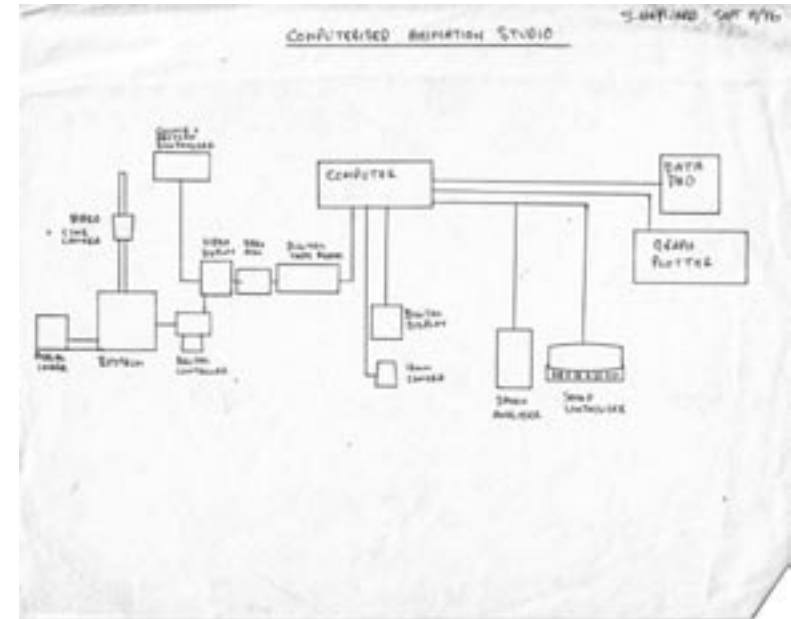
04 SPINNING GAZEBO

> Clive Richards (1970)

> 2 minutes

> Courtesy Clive Richards and Coventry School of Art & Design

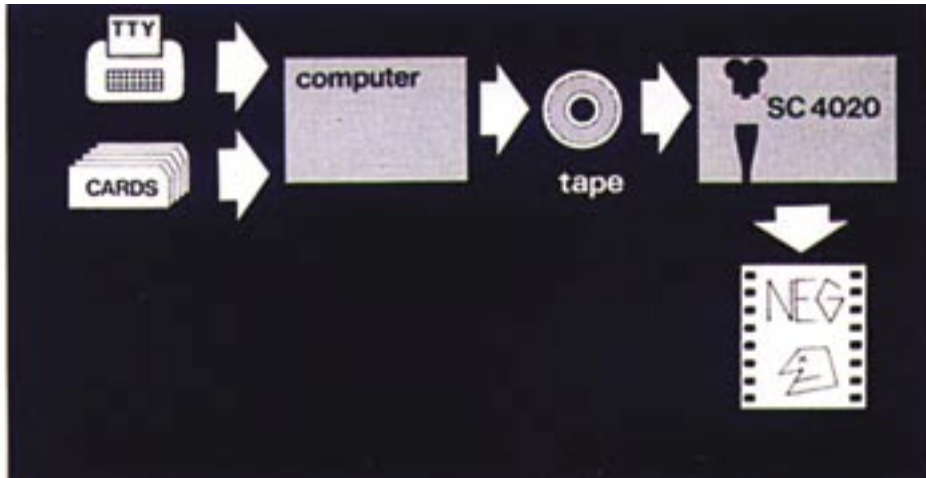
By the early 1970s, one of the major routes into computer arts was through



< Stan Hayward, drawing for computerised animation studio, 1976 >
< reproduced courtesy the artist >



< The animated logo for the new Lanchester Polytechnic >
< produced at Coventry School of Art & Design >
< reproduced courtesy of Coventry School of Art & Design >



< Diagram by Alan Kitching illustrating the computer animation process >
< reproduced courtesy of the artist >



< The Computer Studio c.1972 showing D-MAC system as used in the making of *SQUARE* >
< photograph courtesy George Borzyskowski >

the polytechnics, which concentrated expensive resources into fewer, but larger multi-disciplinary centres, allowing possibilities for cross-disciplinary creative collaboration. Animation activity occurred notably at Middlesex Polytechnic and Coventry, among others. In the late 1960s at Coventry School of Art (in the process of becoming Lanchester Polytechnic), Clive Richards, from a technical illustration design background, worked with Ron Johnson, Head of Computer Science who enigmatically informed him, 'I have this machine that can draw'. The machine was the 39-bit Elliott 803 Computer driving a Benson-Lehner twelve-inch drum plotter, with instructions to the computer given in punched card or paper tape. *Spinning Gazebo*, is a three-dimensional wire frame representation of a gazebo rotating in space and the first computer animation produced in a British art school. Written in ALGOL (a computer programming language designed originally for scientific use and not for this type of application or indeed for animation), each cell was plotted individually and photographed on a rostrum camera. Richards and his team also produced the first logo made in a British art school. Commenting on the Art Deco style lettering, Richards has said that the primitive software was incapable of generating curves and this necessitated the design of letterforms composed of straight lines. Sonia Duffy of the Mathematics Department Computer Laboratory at the Polytechnic assisted by writing some commands. These early animation efforts also acted as in-house feasibility studies for the potential use of computers within the Polytechnic. Richards and his colleagues went on to acquire more powerful equipment, write software packages for artists and designers and establish pioneering computing courses within Art & Design, with the *Computer Picture Book* published in 1979, giving many examples.

05 INSIDE/OUTSIDE

> Darrell Viner (1976)

> 3 minutes

> Courtesy estate of the artist

Made whilst a post-graduate at the Slade School of Art, *Inside/Outside* was described by Darrell Viner (1946-2001) as, 'a way of setting two qualities (black and white) in opposition to each other, so that the opposition will somehow resolve itself in favour of one of its constituents.' An early working title of 'Two Units' was later dropped. The film can be viewed as a study on the nature of drawing, based on what Viner called, 'the fundamental property' of outlined shapes – marks delineate areas which are at once inclusive and exclusive. Viner often worked with Allan Hume, then a technician at University College London, to create animated films using

the UCL mainframe. *Inside/Outside* was done in one take output direct to 16mm film and can therefore be seen as a straight record of the computer's performance according to the program, with no editing in the traditional sense. The film was exhibited at the Coracle Press, London in 1977.

// Viner's synergistic relationship with the computer really took off with the dynamic sculptural works he made at Hornsey College of Art from 1971 working with John Vince, at that time a programmer in what was becoming Middlesex Polytechnic. Here Viner began to establish an aspect of his unique style, combining movement with computer-generated imagery. Although computing was just one of his wide interests, building his own hardware and programming systems resulted in the creation of interactive and electronically controlled works for which he became well known. In 1980 Viner wrote that over the years his programs had become more expressive, 'I am basically programming myself into the computer in that the programs are very much about the images I react to and which excite me.'

06 THE MATHEMATICIAN

- > Stan Hayward (1976)
 - > Colour Sound 3 minutes
 - > Courtesy BFI

The Mathematician brought together all the techniques from Hayward's computerised studio concept and is thus surely the first completely computer-produced entertainment film made in the UK. Although the press announced that 'Computers had arrived in the Film business' (*TV Mail*), and the benefits of computers for animation appeared obvious, the markets were not and Hayward's Computer Studio was ahead of its time. In 1973, he formed Video Animation Ltd, in partnership with Imperial College and operated from the Nuclear Power Dept., producing logos for television and various jobs for the Open University. Keen to prove that computers could be used in every aspect of animation filmmaking, a grant from the BFI and private backing enabled Hayward to finish this film at Imperial College. The film tells the salutary tale of a genius mathematician who discovers that mankind is heading for environmental disaster. Ignored by all, he sets out to prove it – however the proof, represented by "a little black box", is taken up by those previous doubters and exploited.

// Hayward's work and that of other computer animators was featured twice on the BBC's *Tomorrow's World* programme in the early 1970s. In the 1980s, Hayward created the popular children's character Henry's Cat (with Bob Godfrey) and is currently involved with Making Movies, free film scriptwriting and animation software for schools.

[SECTION TWO : CRAFTING CODE]

In the early 1970s, artists from the Royal College of Art wrote code and developed specialist software to create a range of effects. This section is introduced by Dr Charlie Gere, who was chief instigator on the CACHE Project and is currently Reader in New Media in the Institute for Cultural Research, Lancaster University and Chair of Computers and the History of Art (CHArt).

07 Selection from ANTICS SHOWREEL (1972-79) including:

- > THE DREAM OF ARTHUR SLEAP
 - > Alan Kitching
 - > Colour Sound
 - > Courtesy BFI
- > Titles from THE BURKE SPECIAL
 - > Alan Kitching & Colin Emmett
 - > Courtesy the artists
- > BEAN & BEAN TEST SEQUENCE
 - > Colin Emmett & Alan Kitching
 - > Courtesy the artists
- > THE STORY OF G
 - > Alan Kitching
 - > Colour Sound
 - > Courtesy the artist

Alan Kitching and Colin Emmett's research and development at the Atlas Lab led to the creation of Antics, (ANimated Technicolor-Image Computer System) – animation industry software still in use today. Graduate of St Martins School of Art, Emmett initially heard about the Lab from Malcolm Le Grice c.1969-70, and learned programming at weekend workshops run by the Computer Arts Society. Studying at the RCA from 1971 allowed Emmett to access the Lab, which by that time had acquired an ICL1906A, as a replacement for the Atlas machine. Coming from a background in architecture, graphic design and traditional animation, Kitching's earliest experiments took place at Imperial College from c.1971.

// *The Dream of Arthur Sleap* (1972) was a 35mm cinema commercial for the BFI and the NFT commissioned by Bruce Beresford, to promote BFI membership. Created using conventional cel technique throughout, only the twirling end title shot, based on the BFI logo, was computer produced on Imperial's IBM, plotted to b/w film on the Atlas Lab's recorder and subsequently printed to colour at Technicolor Labs. The aim was to show

that freely-drawn shapes (such as the BFI logo lettering) could be successfully animated by computer, as well as geometric images prevalent in computer graphics at that time.

// The creation of Antics, a move on from previous methods of computer animation, allowed "outlined" shapes and areas (called vector images) to be filled in, morphs between master frames done more easily and optical sound tracks generated. A test-bed for the Antics program, the title sequence for the BBC's science series *The Burke Special* (1972) took high contrast images of presenter James Burke's face from different angles, in-betweened automatically from one to another to convincingly create the effect of the head turning in three-dimensions, before transforming into the title lettering. In computer animation, one of the first things to be automated was "in-betweening" (today termed a morph). Although begun at the Atlas Lab, due to its commercial nature the film was completed at a time-share facility on an IBM machine.

// Another early work using Antics was *Bean*, (c.1972-73), with a script and design by Emmett, described as, 'a humorous animated film featuring the meeting of two amorous bouncing beans.' It demonstrated that a natural quality of movement and timing consistent with hand animation could be achieved by these techniques.

// *The Story of G* (1979) was made whilst Kitching was at Swedish TV (then known as Sveriges Radio) in Stockholm, and produced as a collaboration with the local art school. Using the spare capacity of the organisation's mainframe plus a single monochrome terminal (a black-and-green Tektronix 4014), the recording was done frame by frame using a 16mm Bolex camera. As this technique did not permit the use of the triple-run recording technique the artist had developed at the Atlas Lab, in its first version, the film was entirely monochrome, although the Antics software included full colour data. Seven years later, at his own company, Grove Park Studio in London, Kitching was finally able to record this movie in its original colours (as seen here).

08 FINITE ELEMENTS

- > Alan Kitching, sound Peter Hadingham, executive producer Jean Crow, (1975)
- > Colour 10 minutes
- > Courtesy CCLRC Rutherford Appleton Laboratory

Begun in 1973, this educational film was a collaborative project conceived by Jean Crow of the Atlas Lab, (now part of CCLRC Rutherford Appleton Labs) to explain and demonstrate the development of the Finite Elements computing technique for engineering applications. Intended to raise the



< Alan Kitching, examples using Antics, 1973 >
< reproduced courtesy the artist >



< Alan Kitching, still from *FINITE ELEMENTS*, 1975 >
< reproduced courtesy CCLRC Rutherford Appleton Laboratory >

[SECTION THREE : INTO THE COMMERCIAL WORLD]

Many pioneering techniques eventually fed into the wider commercial film and television world towards the end of the 1970s and into the 1980s. During this period, a downturn in institutional funding coincided with a rise in demand from the commercial sector for sophisticated graphics – rapidly becoming more easily produced via computer. By the early 1980s, the personal computer revolution changed the technological landscape. It was no longer imperative to construct one's own hardware or write code, computer graphics were also becoming highly visible on television and in motion pictures.

// This section is introduced by Dr George Mallen, a founding member of the Computer Arts Society, and the founder and Managing Director of System Simulation Ltd (SSL). SSL was set up in 1971 to facilitate the commissioning process and production of much computer graphic and animation work, including that for *Alien*. Today SSL is a software engineering firm specialising in software infrastructures for cultural heritage and e-publishing applications. It has also been the repository of much historic CAS material.

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- 10 Animation for 20th Century Fox ALIEN, dir. Ridley Scott
 > Alan Sutcliffe/System Simulation Ltd (1978)
 > 30 seconds
 > Courtesy the artist & 20th Century Fox

The read-outs on the spaceship Nostromo's flight deck computer screens – a very early use of computer graphics in a major Hollywood movie. The clip seen here was created by Alan Sutcliffe, a programmer at ICL and instigator of the Computer Arts Society, whose task was to depict the underlying terrain of the landing sequence, creating a 3D model of the mountain range as the spaceship landed. He took measurements from a polystyrene model of the mountains and attempted to, 'make computer output look like computer output ... the screen was to be surrounded by meaningful-looking animated displays showing altitude and angles and such like.' Sutcliffe worked at the Atlas Lab on the Prime 400, in the evening when he was allocated computer time outside of office hours. His program was written in Fortran with calls to FROLIC subroutines.

// Others who worked on the *Alien* project include Mike Stapleton and John Lansdown. Using FROLIC Colin Emmett and Brian Wyvill worked

on part of the landing sequence and created animated scenes that were meant to look as though they were generated in real time on a futuristic computer (see colour plate). Unfortunately, this original footage does not appear to have survived. Tony Pritchett's initial work ended up on the cutting room floor, but his second attempt, a few seconds of footage of the separation of the module of the spacecraft was used and indeed appeared again in Ridley Scott's *Blade Runner* (1982). The animators found that they had to work within the unusual aesthetic desired by Ridley Scott for the film. This was the opposite of what one would generally expect to see in science fiction – high tech and shiny new computer systems and indeed was different from most of the other commercial work being produced at the time. The animation was carried out on a number of different machines, demonstrating the overlap at this time in the use of mainframes and the newer, microcomputers.

- 11a HALLS CURTAIN
 > Paul Brown & Chris Briscoe/Digital Pictures (c.1982)
 > 2 minutes
 > Courtesy the artist
- 11b MICHELIN MX LAUNCH ADVERTISEMENT
 > Digital Pictures (1983)
 > Colour 30 seconds
 > Courtesy Digital Pictures

These two films are examples of early work by Digital Pictures, the first company in England to specialise in computerised special effects. It was set up in 1980 by two artists – Paul Brown and Chris Briscoe from the Department of Experimental and Electronic Art (founded in 1973) at the Slade School of Fine Art, initially in partnership with the School as a way of running and maintaining the computer there. Briscoe, who had been Head of the Department, was instrumental in acquiring and customising equipment including a Data General Nova II computer. Brown, an artist specialising in technology, was a graduate of the Department. Digital Pictures was based in the Slade for two and a half years and allowed students continued access to the equipment, whilst tackling commercial jobs. As videotape was not yet available, everything was output straight to film, making pre-viewing difficult. *Halls Curtain*, their first commercial job, was a wire-frame "flight" through the lobby of the yet to be constructed National Gallery of Australia showing a sculpture installation by Nigel Hall. Commissioned by the Annelly Juda Gallery (representatives of Nigel Hall) as part of their proposal to the National Gallery (which was not accepted), the digitisation of the lobby was from architects' plans. It was shot

frame-by-frame off the screen of a Tektronix monitor.

// Another early work was an animated tyre commercial for *Michelin*, starring Bibendum (see colour plate). It was commissioned by design partnership Lodge Cheeseman and featured 3D computer modelling (fully shaded) in colour – known as solid raster graphics. These groundbreaking visual techniques were almost unknown outside the United States and they received a good deal of publicity in the early 1980s. However, there being no room to expand at the Slade, Digital Pictures was forced to move operations and set up on a purely commercial basis in Covent Garden. It became a highly respected company making commercials and advertisements for ten years before its eventual sale to WH Smith.

12 CHANNEL FOUR LOGO

> Lambie-Nairn/Tony Pritchett (1982)

> Courtesy Channel 4

In 1982 Channel 4 became the first new British television channel since BBC2 began broadcasting in 1964. Produced by the designer Martin Lambie-Nairn, the Channel's identity was the first corporate identity campaign specifically devised to exploit the medium of television to the full. A new concept in television broadcasting, Channel 4 would not be making its own programmes, instead would commission a variety of elements from many different sources and pull them all together. Because of this, the logo was designed to indicate the identity of the new channel – a radical departure from the BBC. The animated parts of the 3D number four separate, rotate in space and join together again. Project managed by SSL, Tony Pritchett worked with John Lansdown to produce the animation, initially plotted in line form on paper and then hand-coloured. This did not give the desired effect, however, and a fully computer rendered solution was sought. As the equipment to achieve rendering was not available in the UK, Pritchett turned to Triple I (Information International Inc) in Los Angeles. Triple I had just finished a major feat – special effects for the motion picture *Tron*, which used extensive CGI. Using their unique Foonley super computer with a hired terminal that could read Pritchett's tape from home (written in BASIC), final colour renderings with highlights were produced. Working to a very tight deadline, it was finished just in time and brought home within a week of the launching of the new channel.

