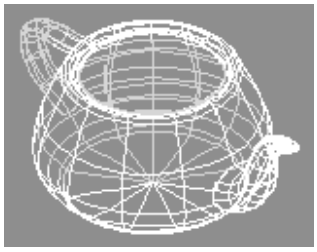
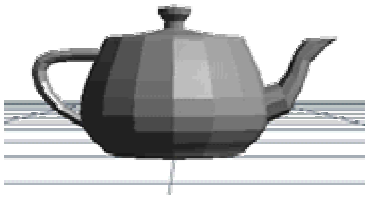
Where did polygons come from?

Face
Edge
Vertex

Phong Gourard Blinn Texture mapping MipMapping Anti Aliasing Bezier Splines NURBS Patch Alpha Blending Fog-ging Dithering Bi-linear Tri-linear Z-Buffer Curve rendering

Left: Dave Theurer
Above:the effect of Gourard shading
Right Utah Teapots





Game graphics history in a nutshell: Oscilloscope blips, black and white, limited lores colour, isometric 3d, parallax scrolling, wireframe, filled vector, millions of colours, higher resolution. Here's how Polygons fit into it: Early 1989 saw the first polygonal racing game at home. But it wasn't the first polygonal game and in fact programmers had been playing with 'CG' or polygon work for a long time. Rendering still images and stringing them together to form animation (CG) has been going on since the 1970's, when icons like the teapot were developed using bezier splines and rendered using various techniques, usually named after the software engineer who created it. On these pages are some noteworthy dates for events, developments and some games which led the path.

After about thirty years of computer graphics progressing from blips on oscilloscopes, the first ever game to use 3D work was released in the late 1970's USA—Speedfreak.

The style of graphic became known as 'wire frame'. Why did it take thirty years to apply polygons in gaming? When curve rendering a teapot in Utah University, Mr Blinn and friends had the power of a mainframe computer and only needed to produce a single picture after many hours of rendering. Games have to produce a minimum of fifteen screens per second to be playable. Of course we prefer sixty frames per second, but in 1980, you couldn't be fussy and you didn't know what 'frame rate' meant anyway.

Chips to take home

1976 Zilog 1Mhz Z80 released.

1977 MOS technologies formed by ex-Motorola staff. Shortly after they create the M6502 which is later slightly changed and used in the Commodore 64.

1979 Motorola design the 68000 at 7.14 Mhz and with 68000 transistors using a 2 stage pipeline.

1982 Texas Instruments release the worlds first single chip digital signal processor (DSP). Digital Signal Processors can act as general purpose processors, but are optimised for certain types of computation (such as signal processing involving matrix computation), usually in embedded applications. Best used for floating point arithmetic. Costs prohibited use in arcade machines for some time.

1987 Archimedes computers used a brand new 32-bit ARM RISC chip, running incredibly fast (30 MIPS) That the Amiga could run a port of a game at similar pace is testament to the quality of the Amiga which on paper is appears much lessor powered.

Software & events

1959 DAC-1, first commercial CAD system, developed in 1959 by IBM for General Motors. Allowed development of 3d line drawings.

1962 Efficient pixel/line drawing algorithm created on an IBM 1401 (analogue computer) by Jack Bresenham.

1970 Pierre Bezier from Renault develops Bezier freeform curve representation.

1971 Henri Gourard publishes his work on shading algorithms.

1973 First SIGGRAPH conference.

1974 Z-buffer developed by Ed Catmull (at the University of Utah). Also texture mapping used for first time.

1975 The Utah teapot was created by Martin Newell whilst at Utah University. Because of the difficulty in producing 3d objects at the time, this model was used throughout universities and such for many years. It became somewhat obligatory for all computers to have this model within 3d packages.

1975 Benoit Mandelbrot from IBM develops Fractal algorithms.

1975 Catmull strikes again and develops a curve rendering technique.

1975 Phong Shading developed by Vietnamese Mathematician Dr Bui Tuong-Phong (at the University of Utah).

1976 Jim Blinn develops reflectance and environment mapping (University of Utah).

1978 Bump Mapping developed by Blinn.

Above: Jack Bresenham
Below: 1959 Cad work
Far below: Jim Blinn

Zilog Z80 chip

- Zilog: meaning 'last word [z] in integrated [I] logic [log]'. Zilog was a 1974 $1.5M Silicon Valley start-up comprising two disgruntled former Intel employees. Lead designer was Italian born Federico Faggin.
- It was designed and complete after 9 months and released to the world during March 1976 for $200.
- The Z-80 was compatible with the Intel 8080. It was vastly improved in terms of price, performance and specification.
- It used 8-bit data and 16 bit addressing, and could execute all of the 8080 operations, but included 80 more instructions.
- Clock speeds ranged from the original Z-80 2.5MHz to the Z80-H (later called Z80-C) at 8MHz, and later a CMOS version at 10MHz.
- Like many processors (including the 8085), the Z-80 featured many undocumented instructions.
- But the thing that really made the Z-80 popular in designs was the memory interface - the CPU generated its own RAM refresh signals, which meant easier design and lower system cost, the deciding factor in its selection for the TRS-80 Model 1.