



# Demo effects on the classic Amiga

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# Overview

- Introduction
- The display hardware
- The copper
- The blitter





# Amiga 500



- Launched in 1987
- 7MHz Motorola 68000, 512kB RAM
- Custom chips for graphics, sound, disk, etc.





# Now vs. then

- GeForce GTX 780: 5 TFLOPS peak
  - At 1920 x 1080, 60 FPS

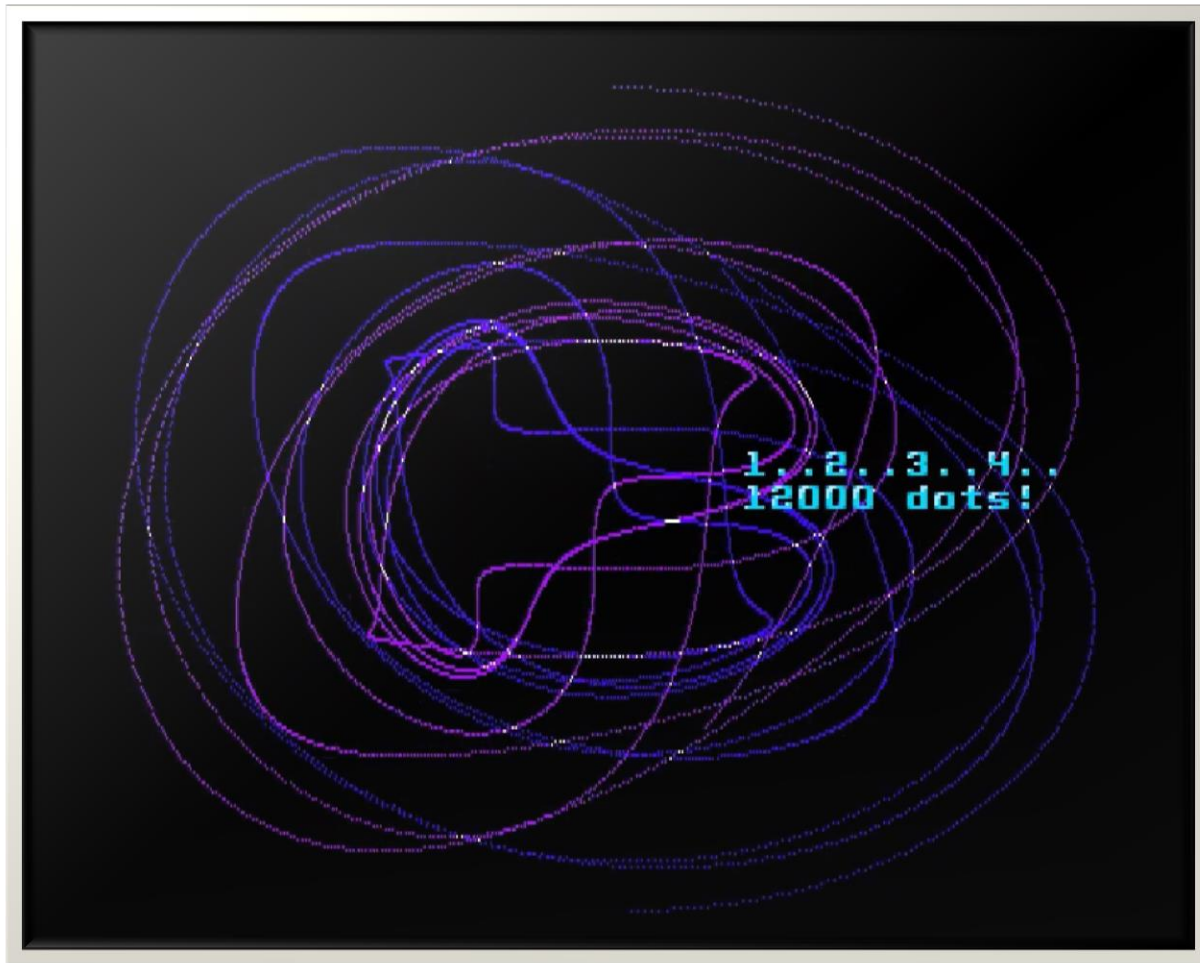
40000 ops / pixel / frame

- Amiga 500: 7 MHz,  $\geq 4$  cycles / op
  - At 320 x 256, 50 FPS

0.4 ops / pixel / frame

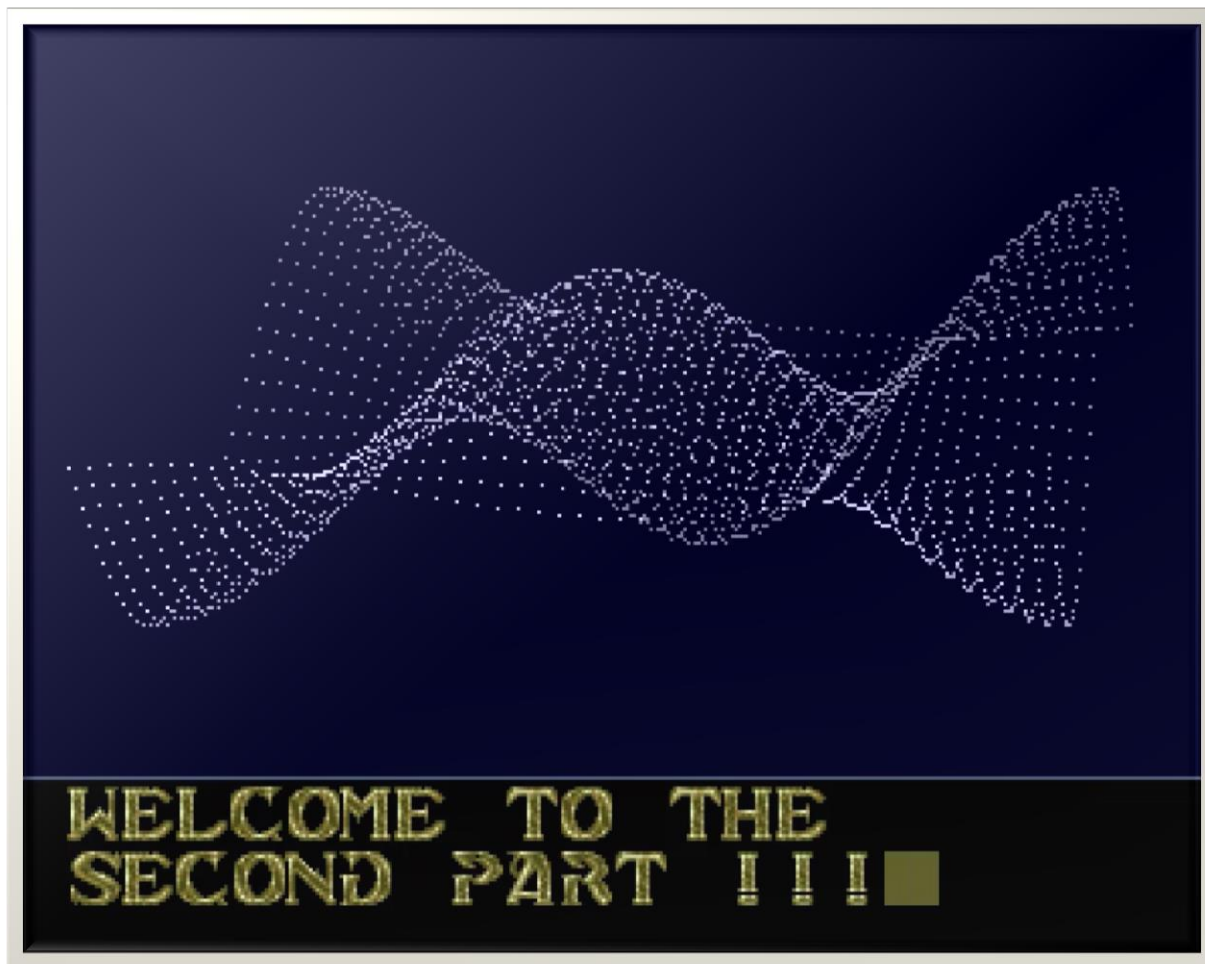


# Effect: Dots



From "Desert Dream" by Kefrens, 1993

# Effect: Sine Dots



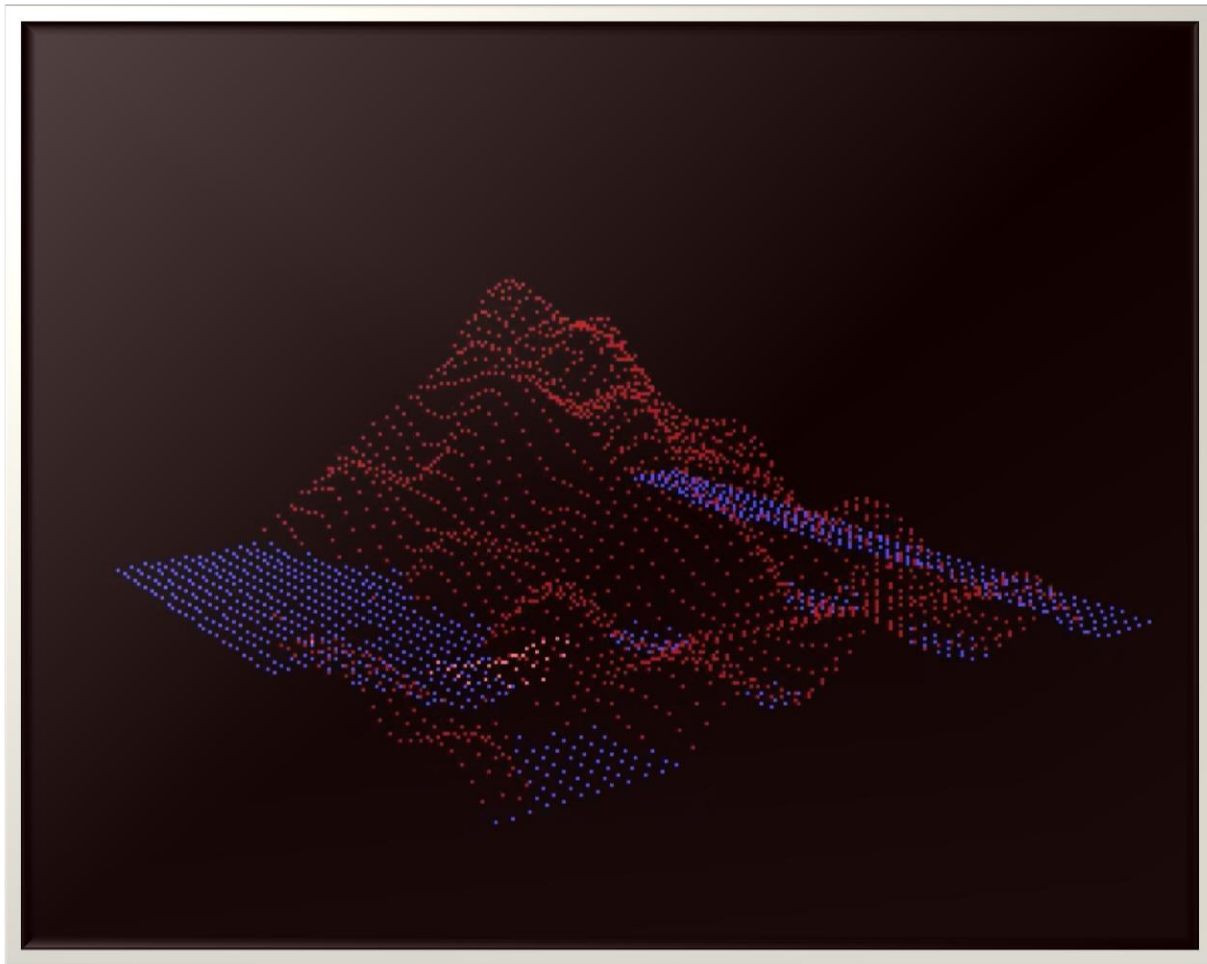
From "World of Commodore" by Sanity, 1992

# Effect: Dot Tunnel



From "Interference" by Sanity, 1993

# Effect: Dot Landscape



From "Arte" by Sanity, 1993





# Bitplanes

0100110111110101 0011011010101010 1010101010101010

1010101101101101 1001011110101000 1010010101010101

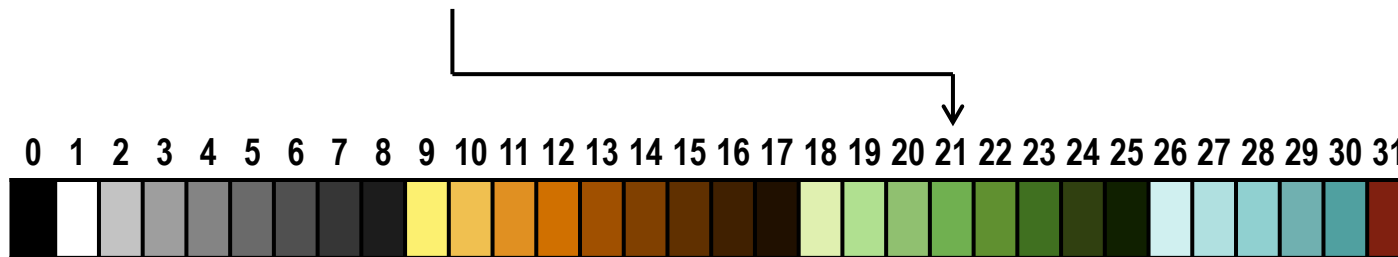
000011110111011 1110000011110111 0111010111010111

1101001111011101 1011101110101110 1100100000101010

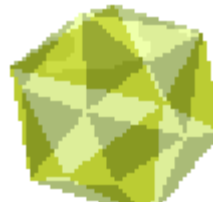
0010111100001010 1111111000010100 1111110010101010

↓ ↓ ↓ ↓ ↓  
1 0 1 0 1

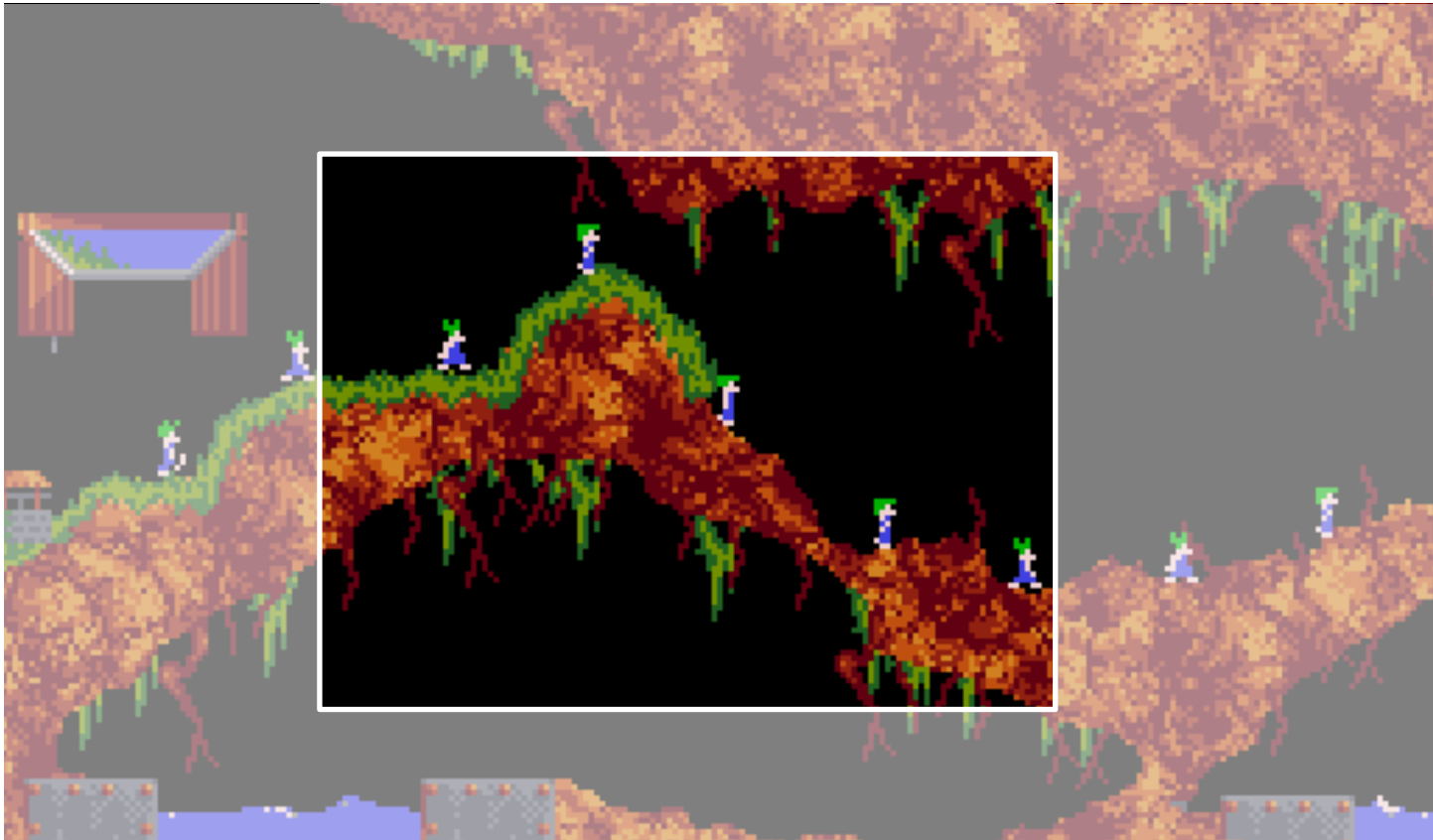
(21)



Output color:

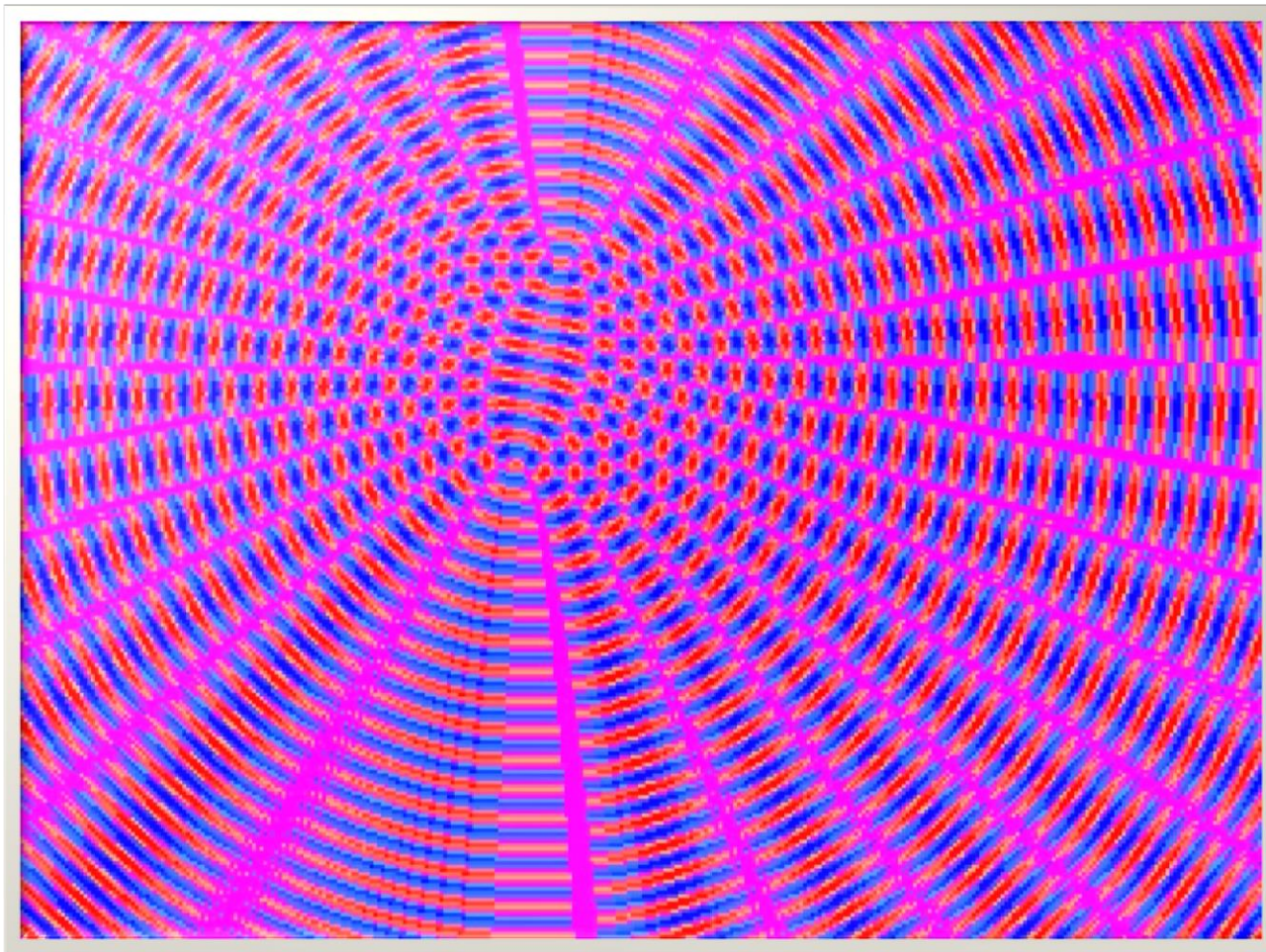


# Playfield offset



Screenshot from "Lemmings" game by DMA Design

# Effect: Interference



From "Mesmerized" by Pure Metal Coders, 1990



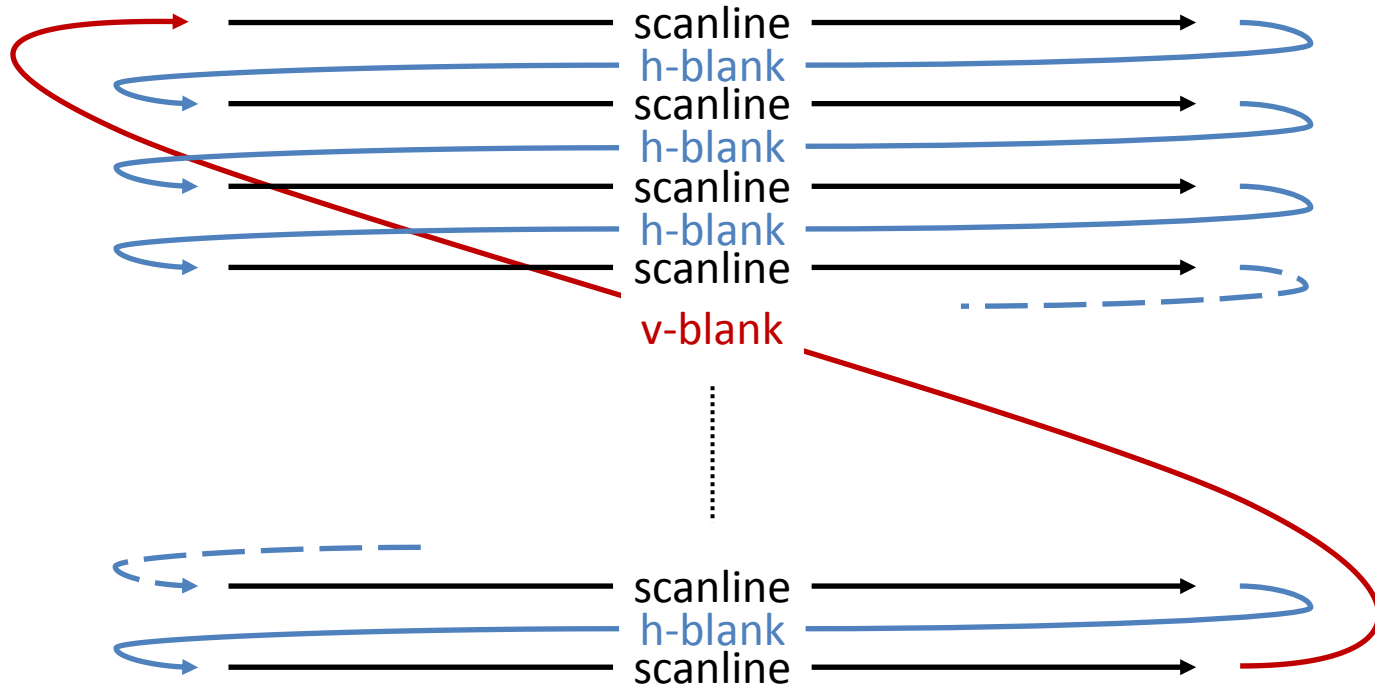
# Effect: Directional Light



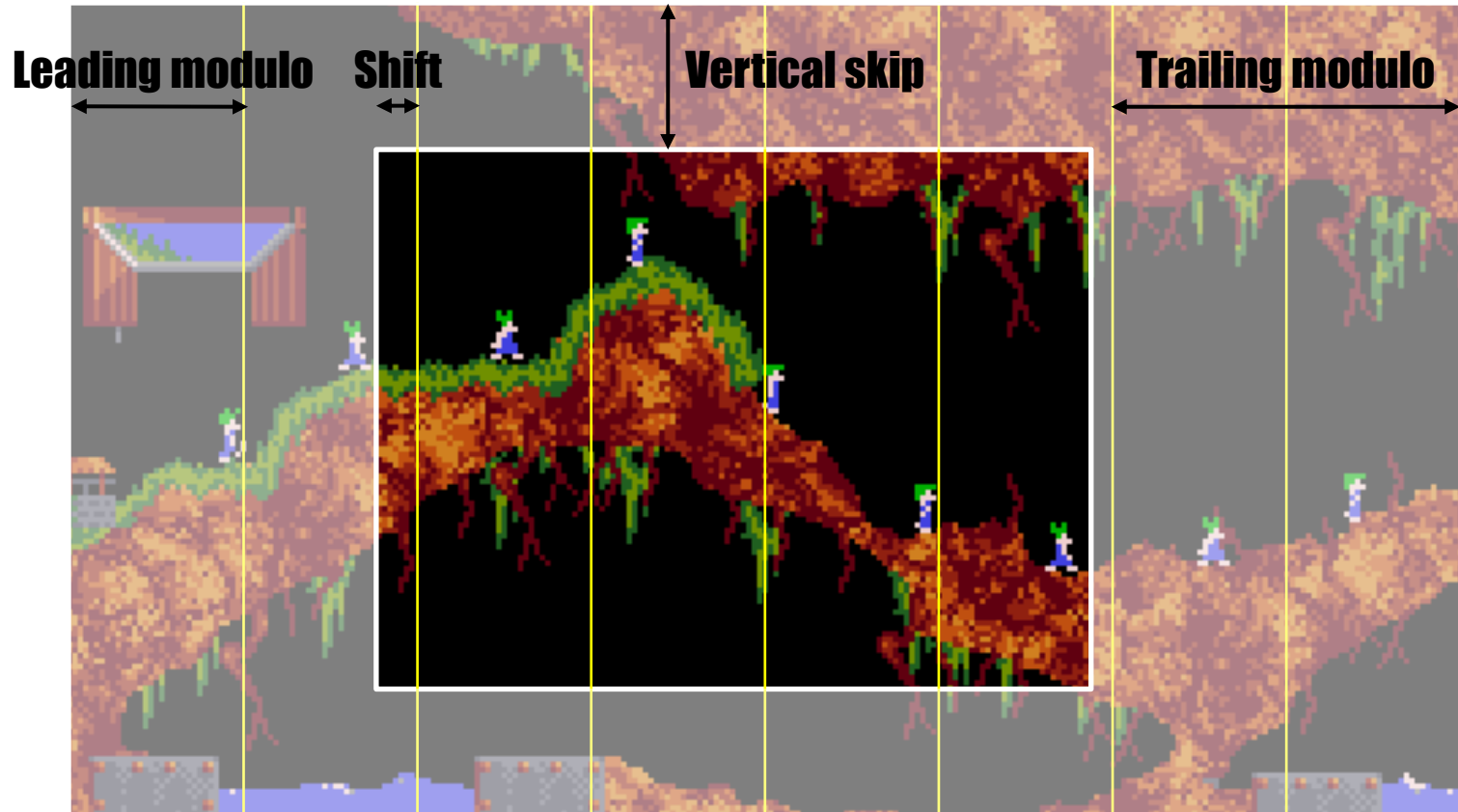
From "Desert Dream" by Kefrens, 1993



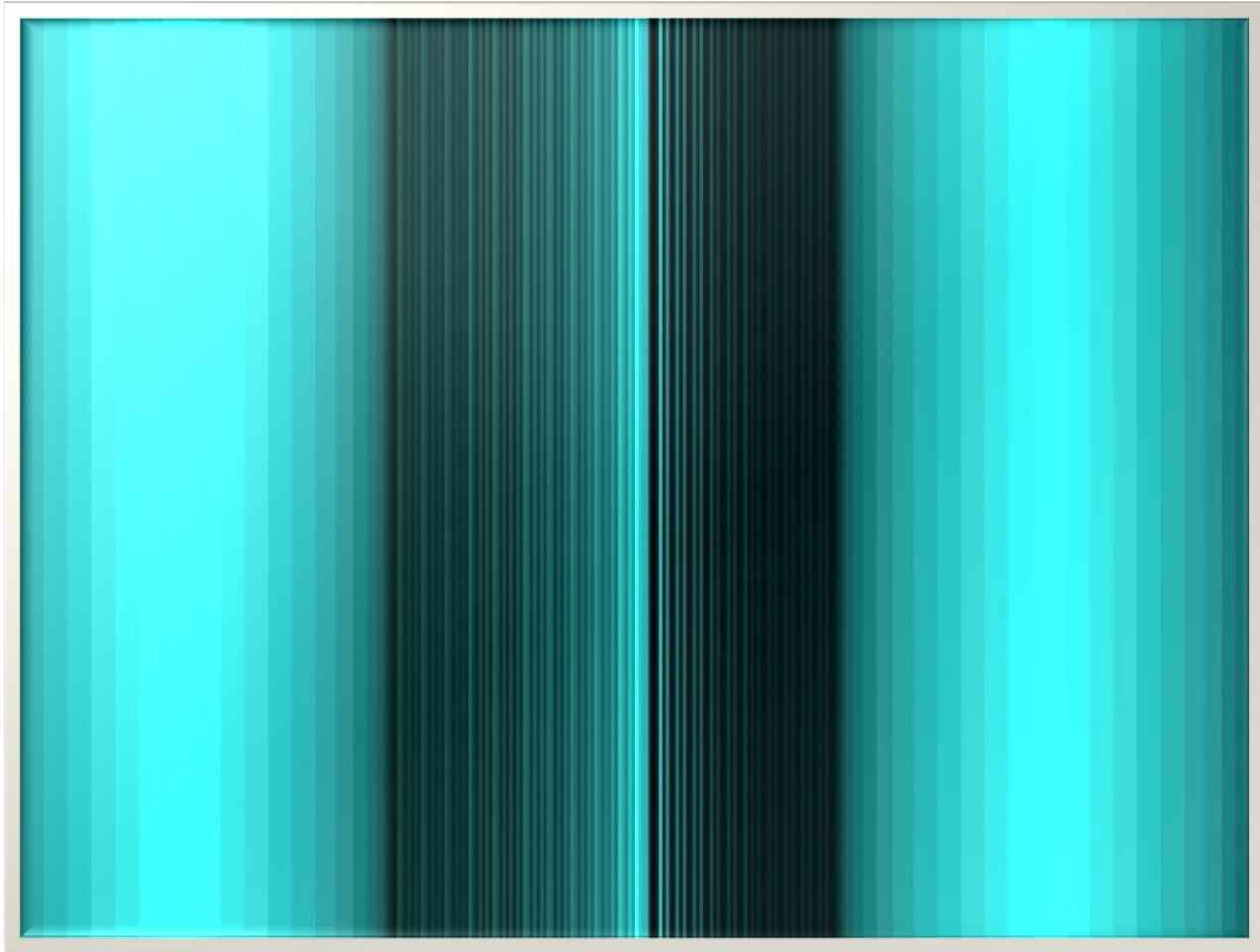
# Electron beam



# Playfield offset in detail



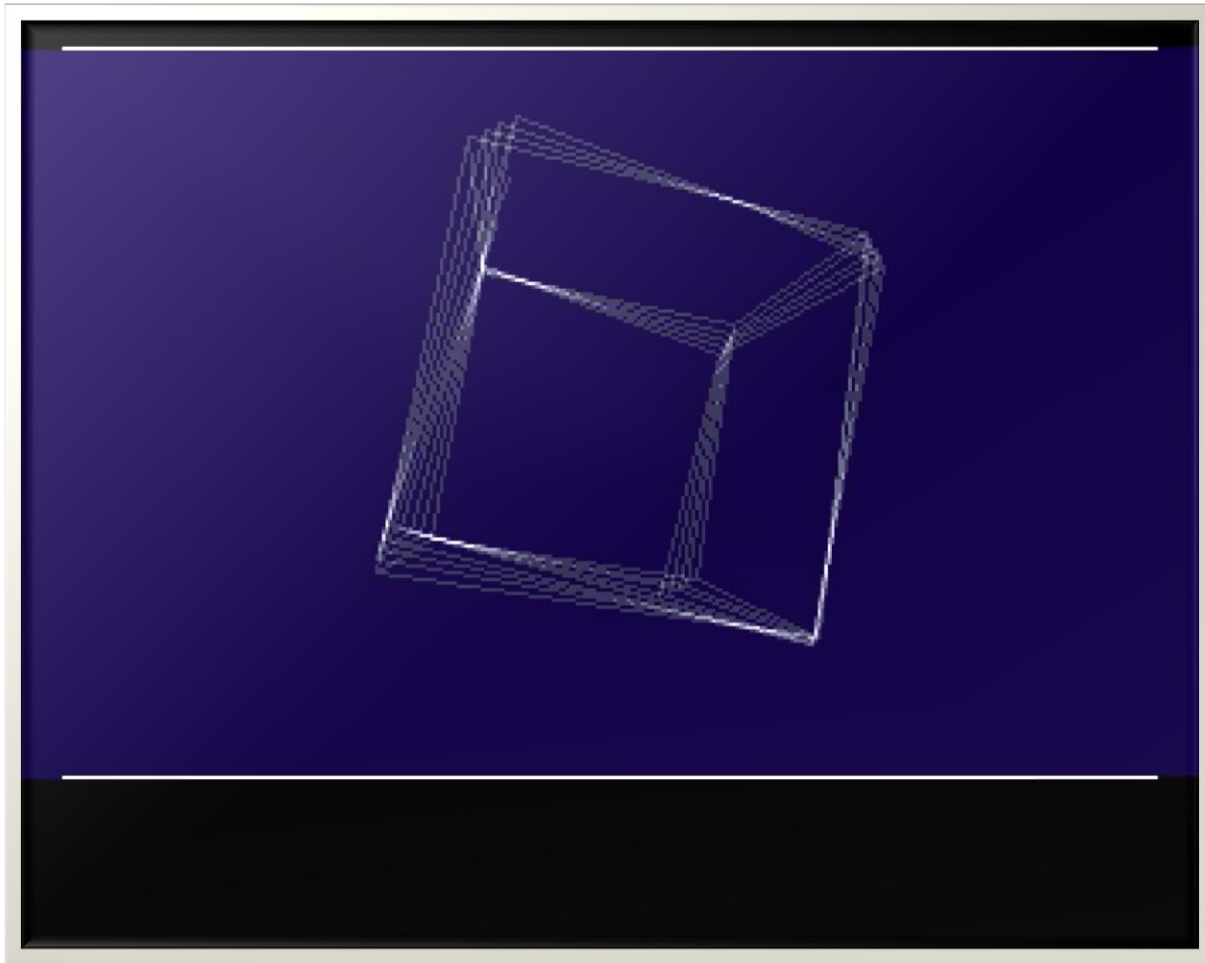
# Effect: Vertical Bars



From "Overdose" by Delight, 1991



# Effect: Motion Blur



From "Hardwired" by Crionics, 1991



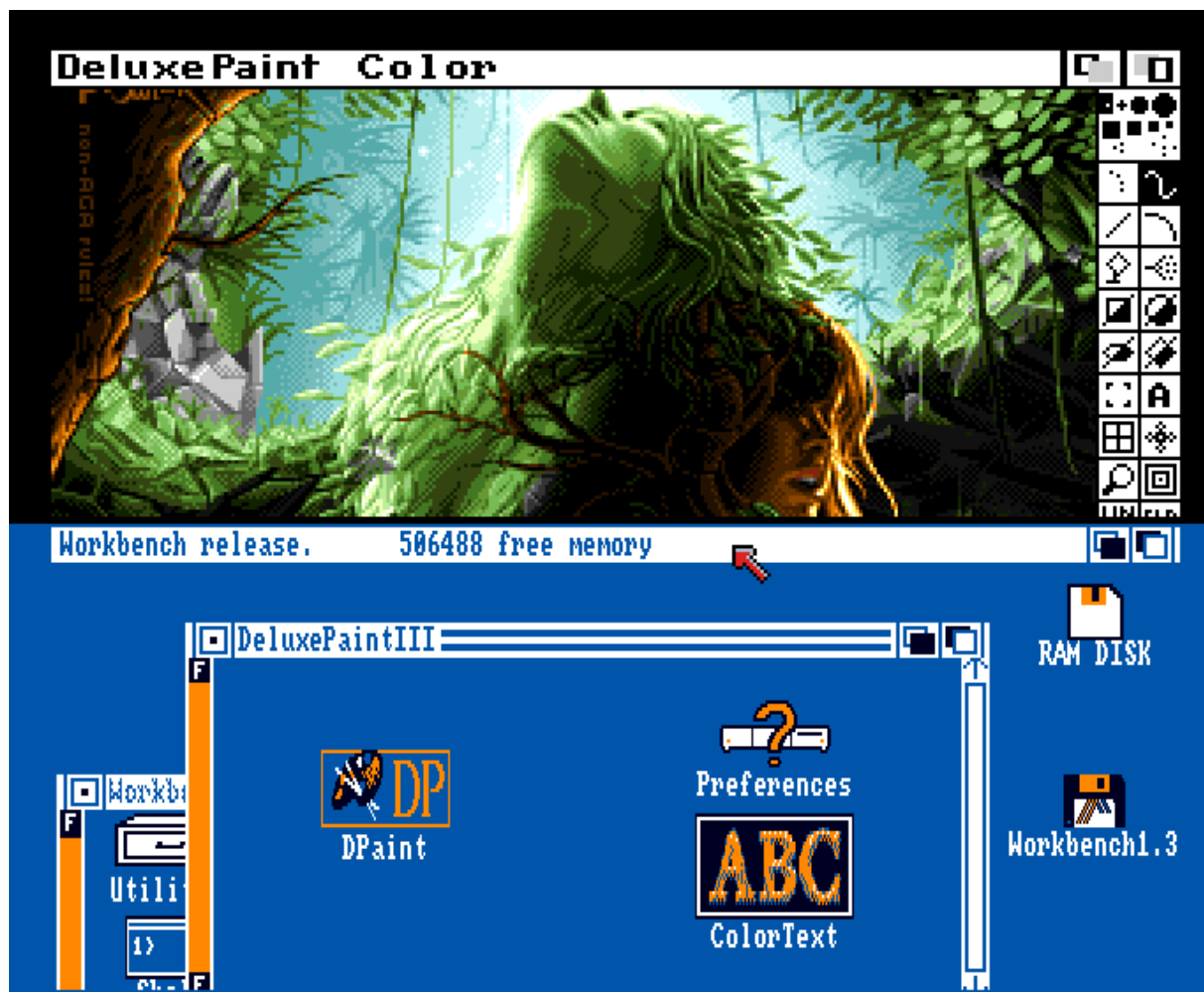


# The Copper

- Co-processor with two instructions
  - MOVE: Write value to hardware register
  - WAIT: Wait for raster position
- Copper list
- Starts execution at every v-blank



# Split screen



Picture "Elements of Green" by Prowler



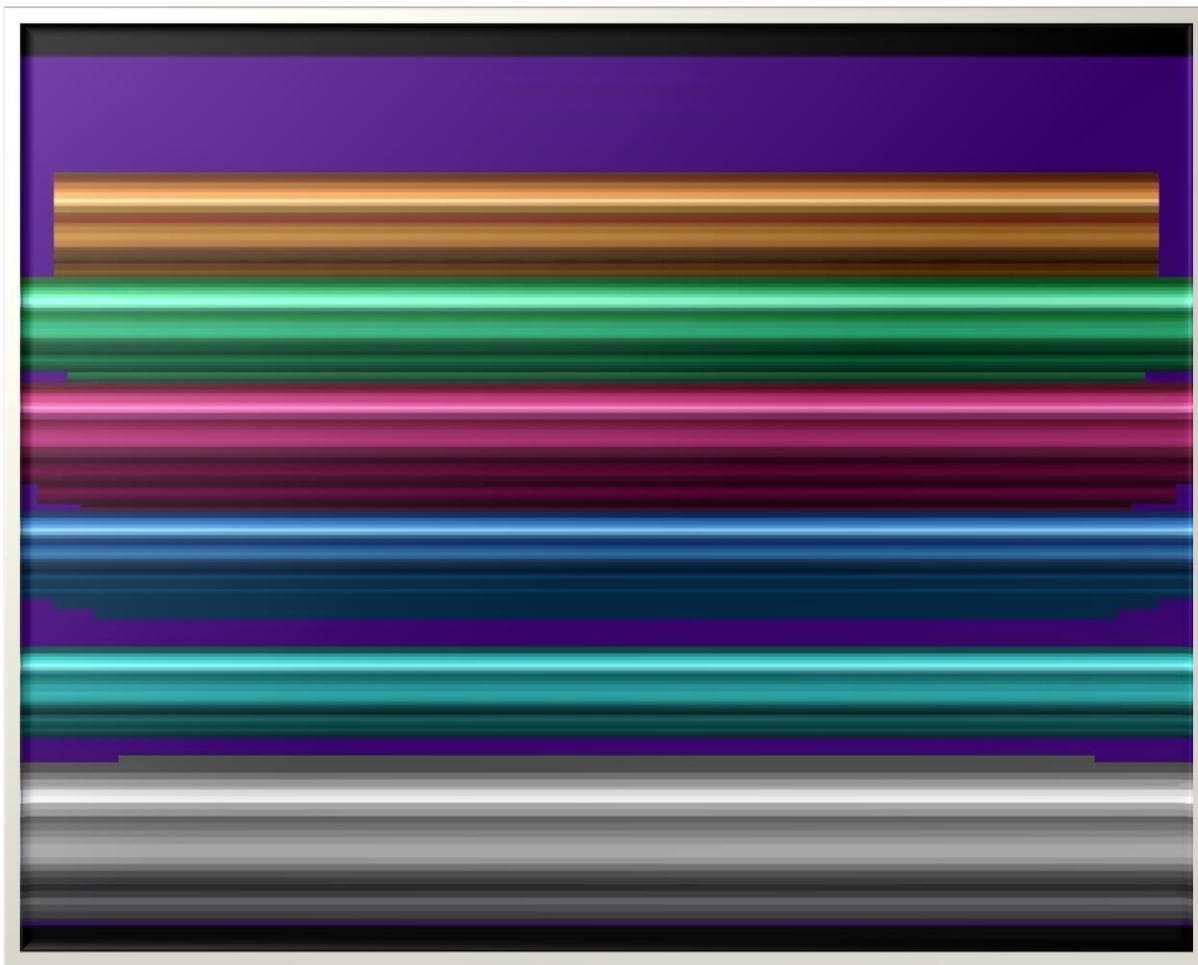
# Effect: Copper Rainbow



From "Copper Master" by Angels, 1990

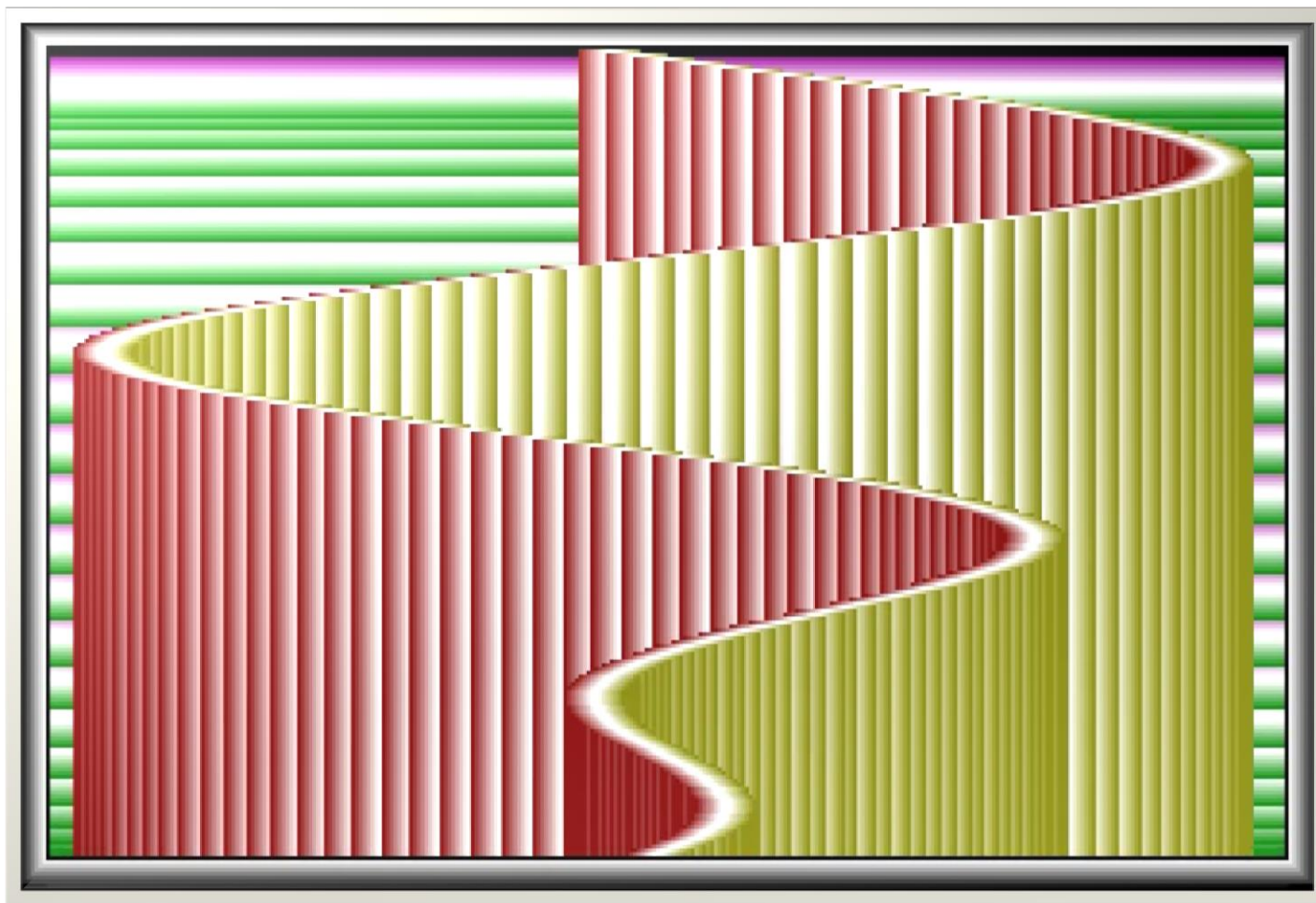


# Effect: Copper Bars



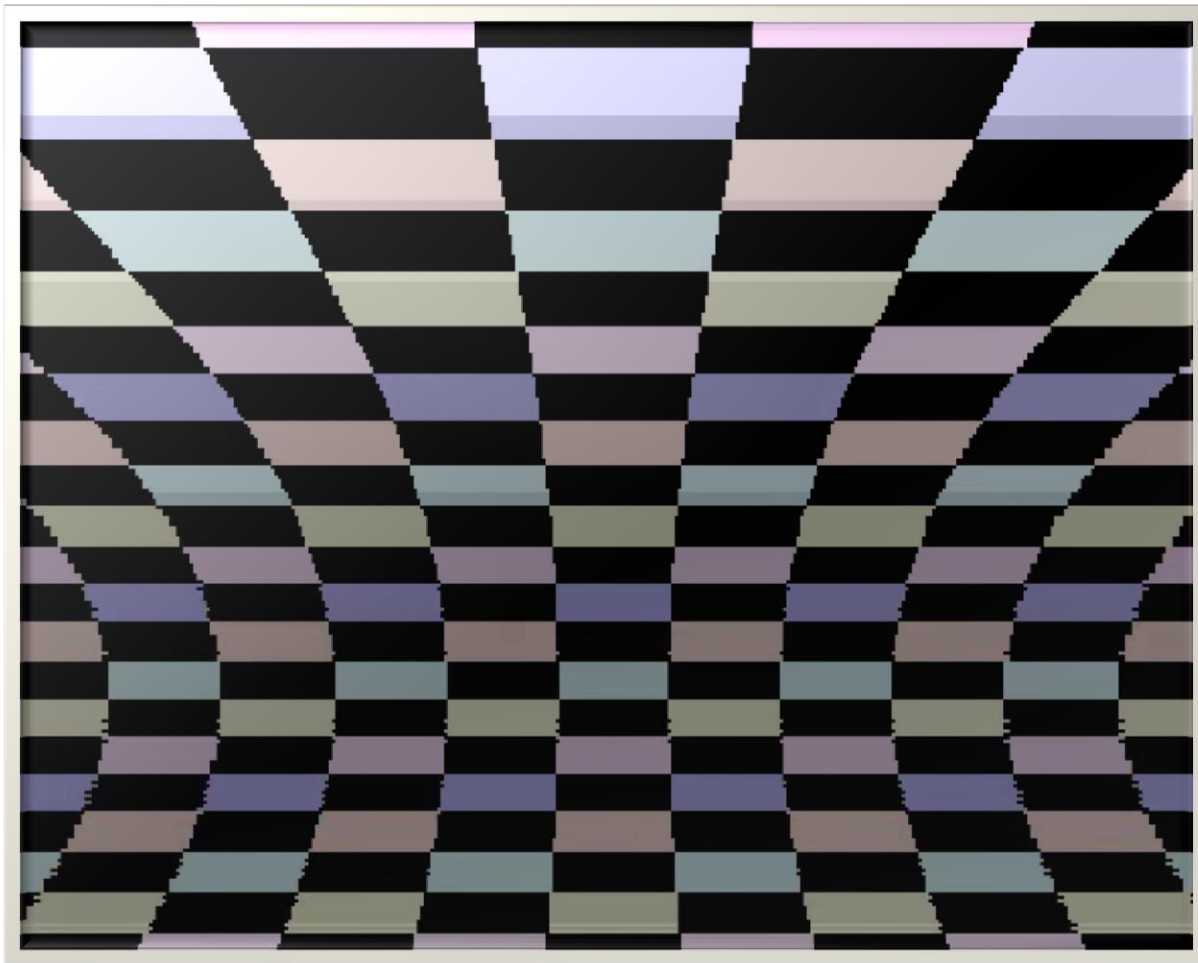
From "Desert Dream" by Kefrens, 1993

# Effect: Kefrens Bars



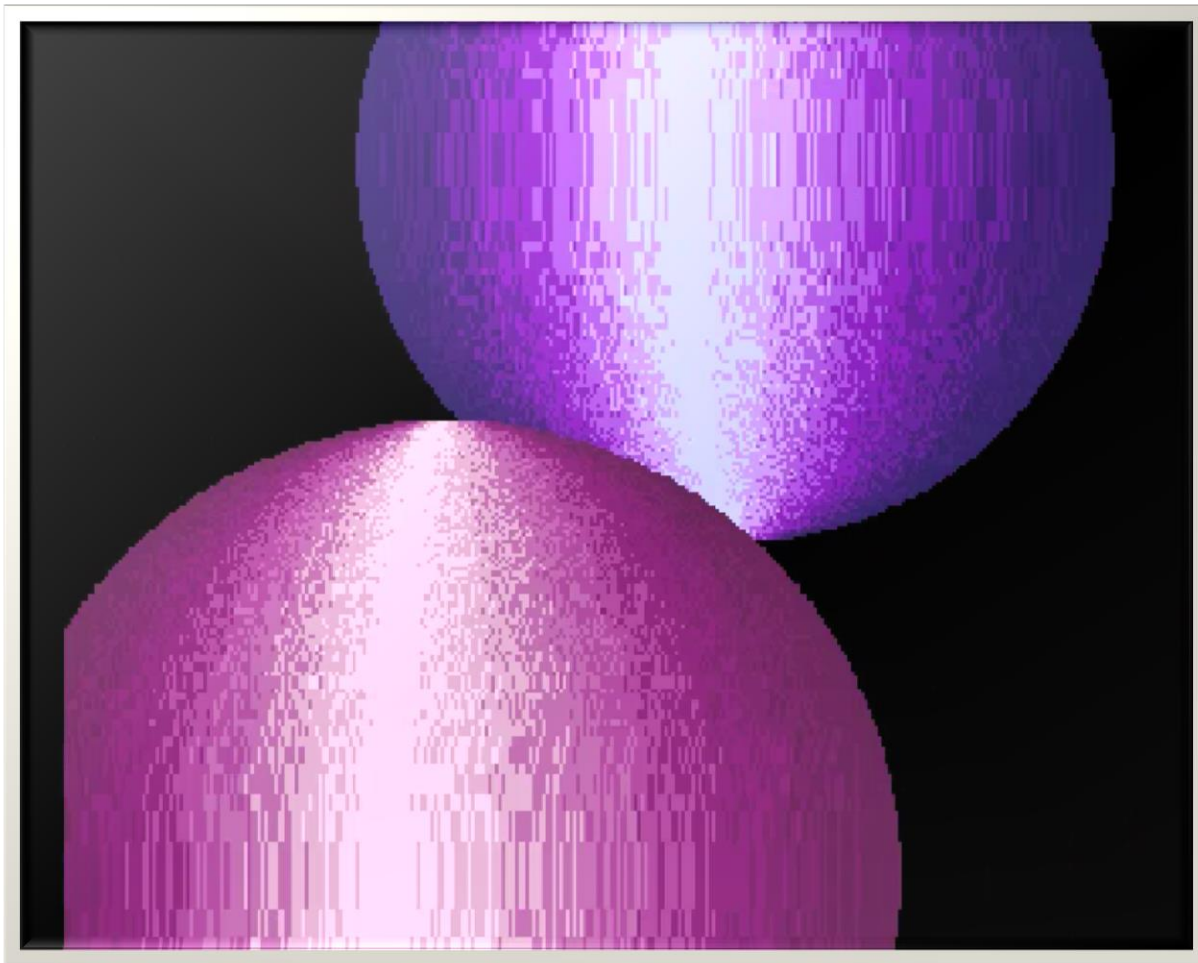
From "Copper Master" by Angels, 1990

# Effect: Wavy Checkerboard



From "Desert Dream" by Kefrens, 1993

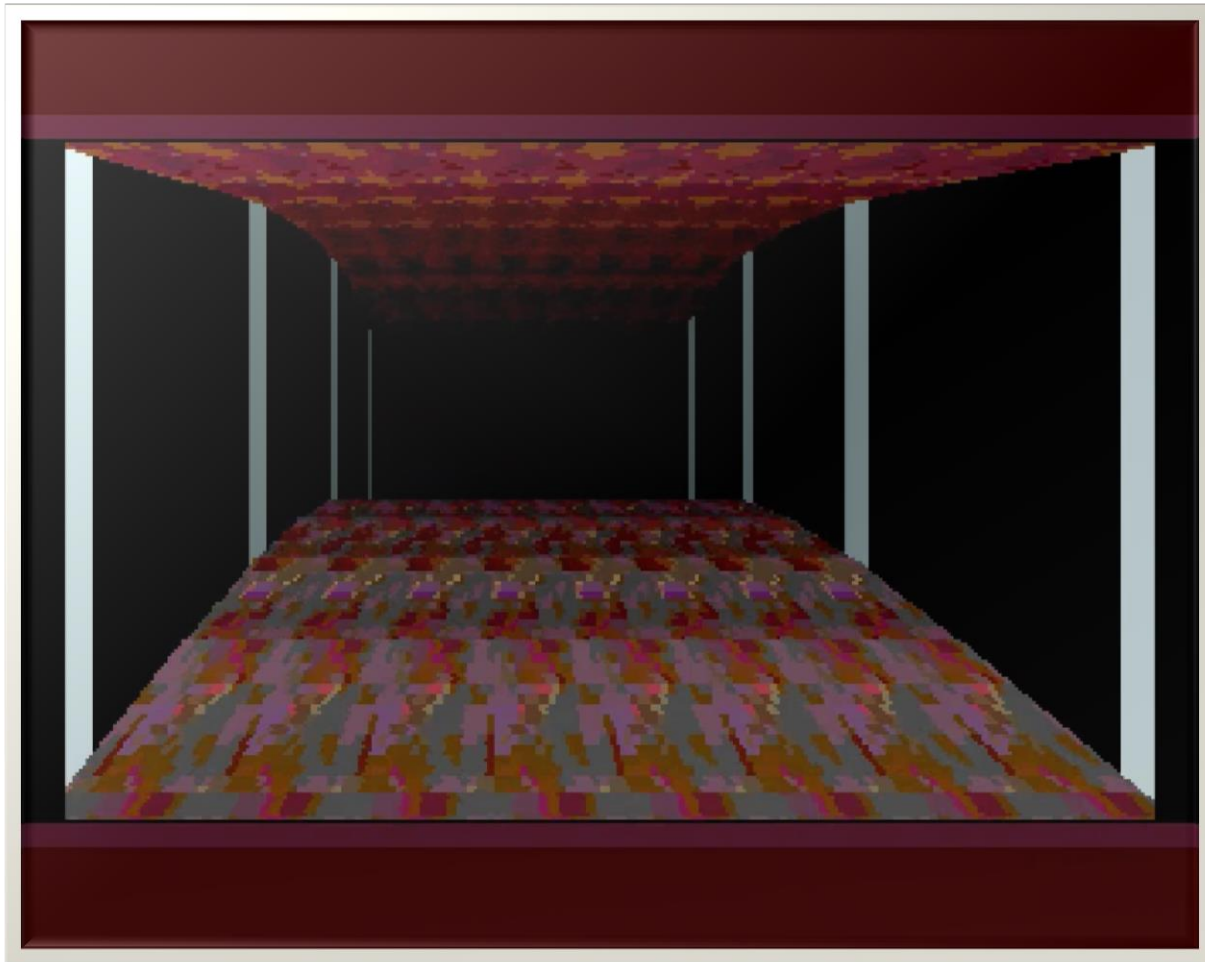
# Effect: Copper Balls



From "Desert Dream" by Kefrens, 1993



# Effect: Stretched Texture



From "Arte" by Sanity, 1993



# Effect: Stretched Image



From "Desert Dream" by Kefrens, 1993



# The Blitter

## Source A

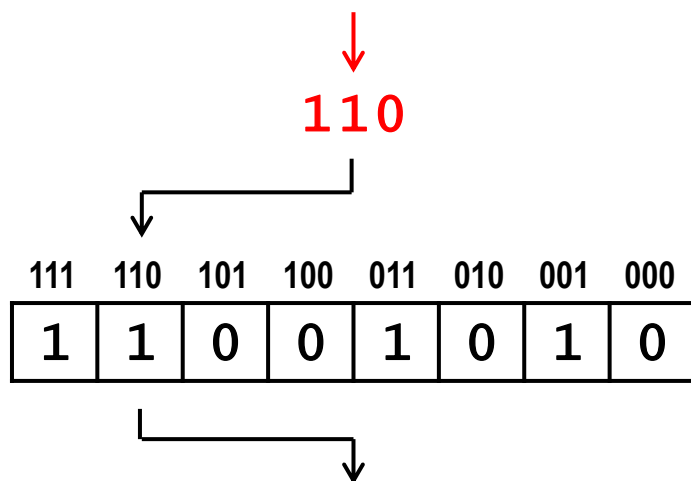
A shift → 000011111000001111100

## Source B

## Source C

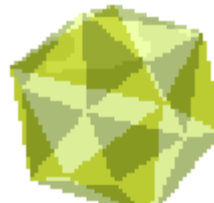
[illegible]

# Minterms



# Dest D

0101010101011110000101011011110





# Cookie Cut

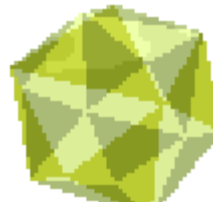
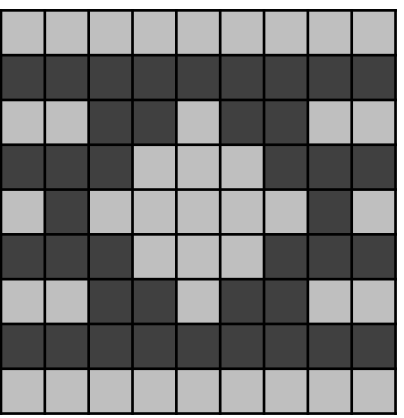
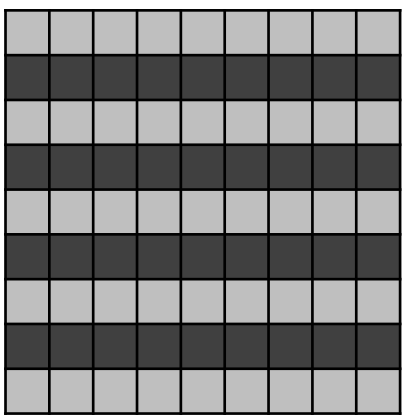
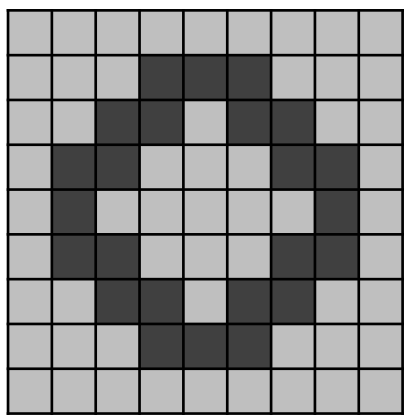
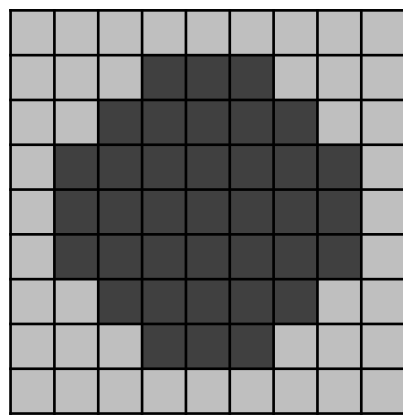
**(A and B) or ((not A) and C)**

Source A  
Mask

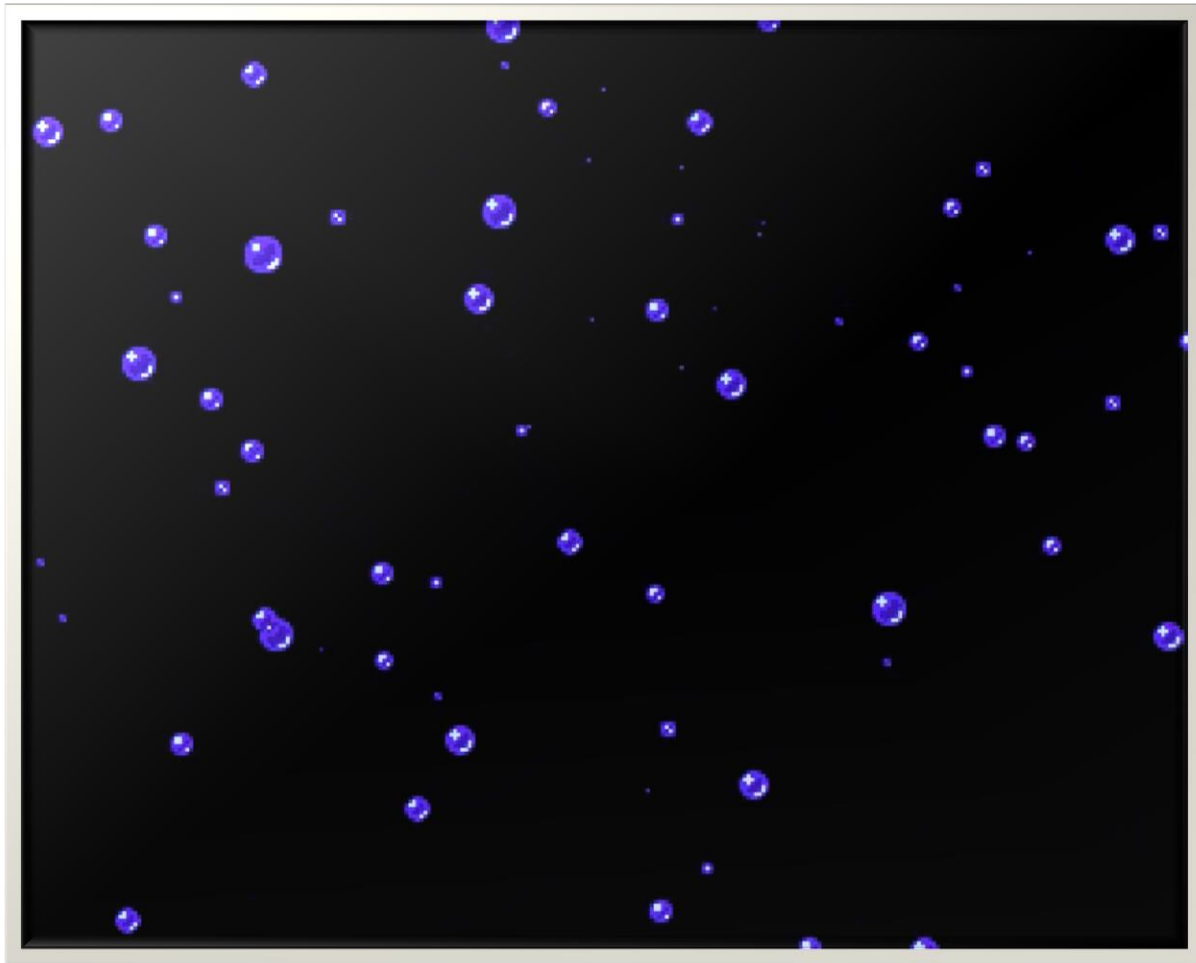
Source B  
Image

Source C  
Screen

Dest D  
Result



# Effect: Bobs



From "Seeing is Believing" by Anarchy, 1991

# Effect: Shade Bobs



From "Hardwired" by Crionics, 1991



# Effect: Chaos Zoomer

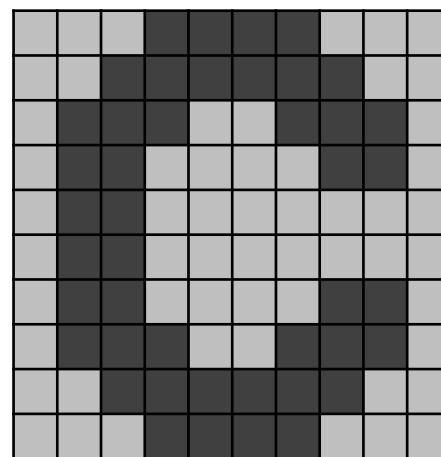
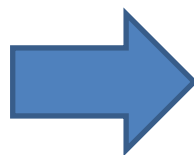
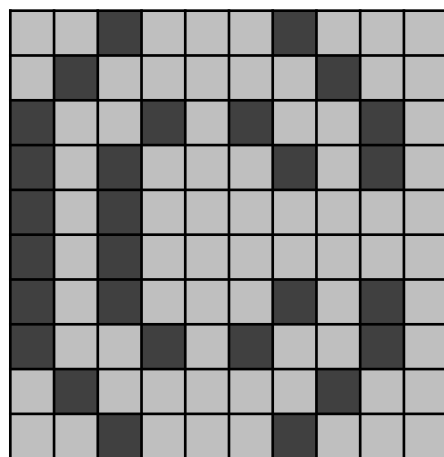


From "Bananamen" by Stellar, 1993



# Blitter filling

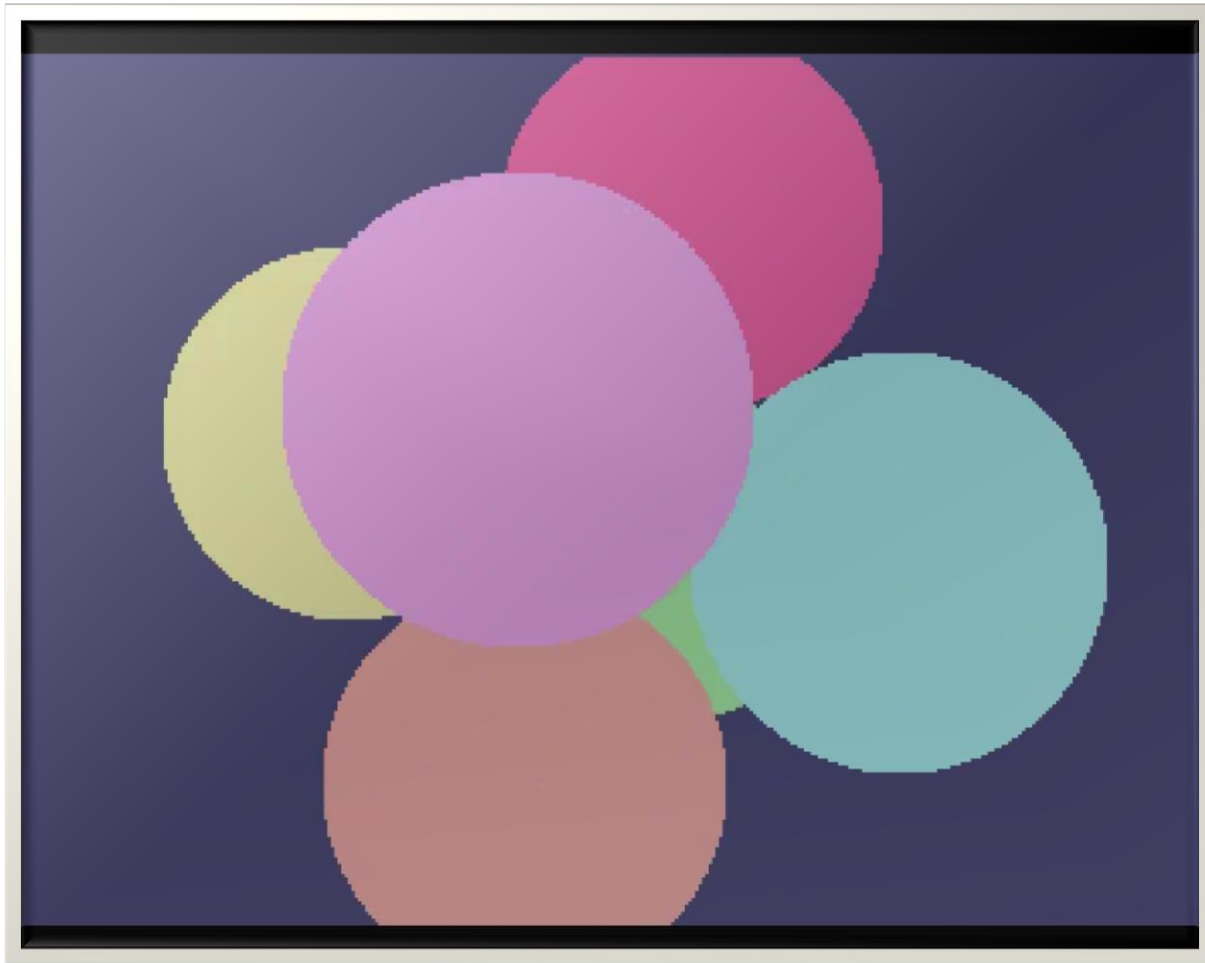
From right to left, switch between 0 and 1 on each 1



(Inverse: XOR with itself shifted one bit to the left)



# Effect: Filled Balls



From "Interference" by Sanity, 1993

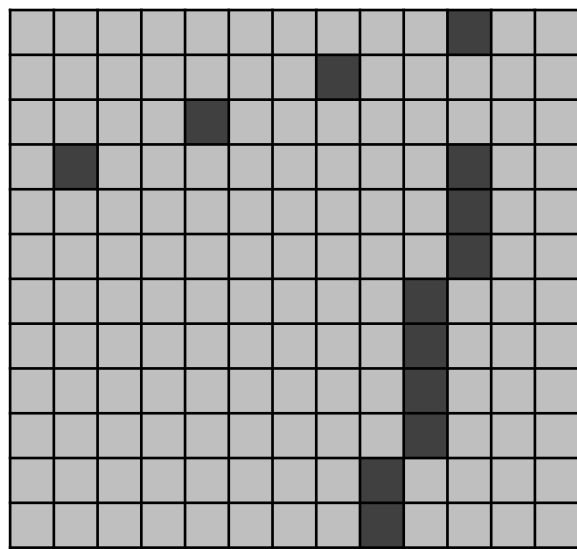
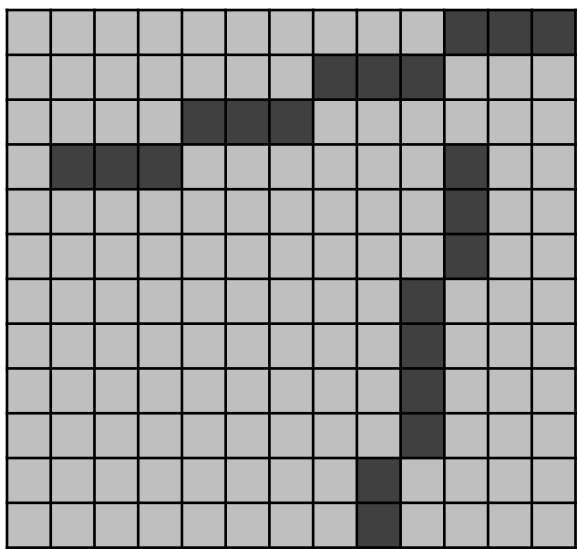




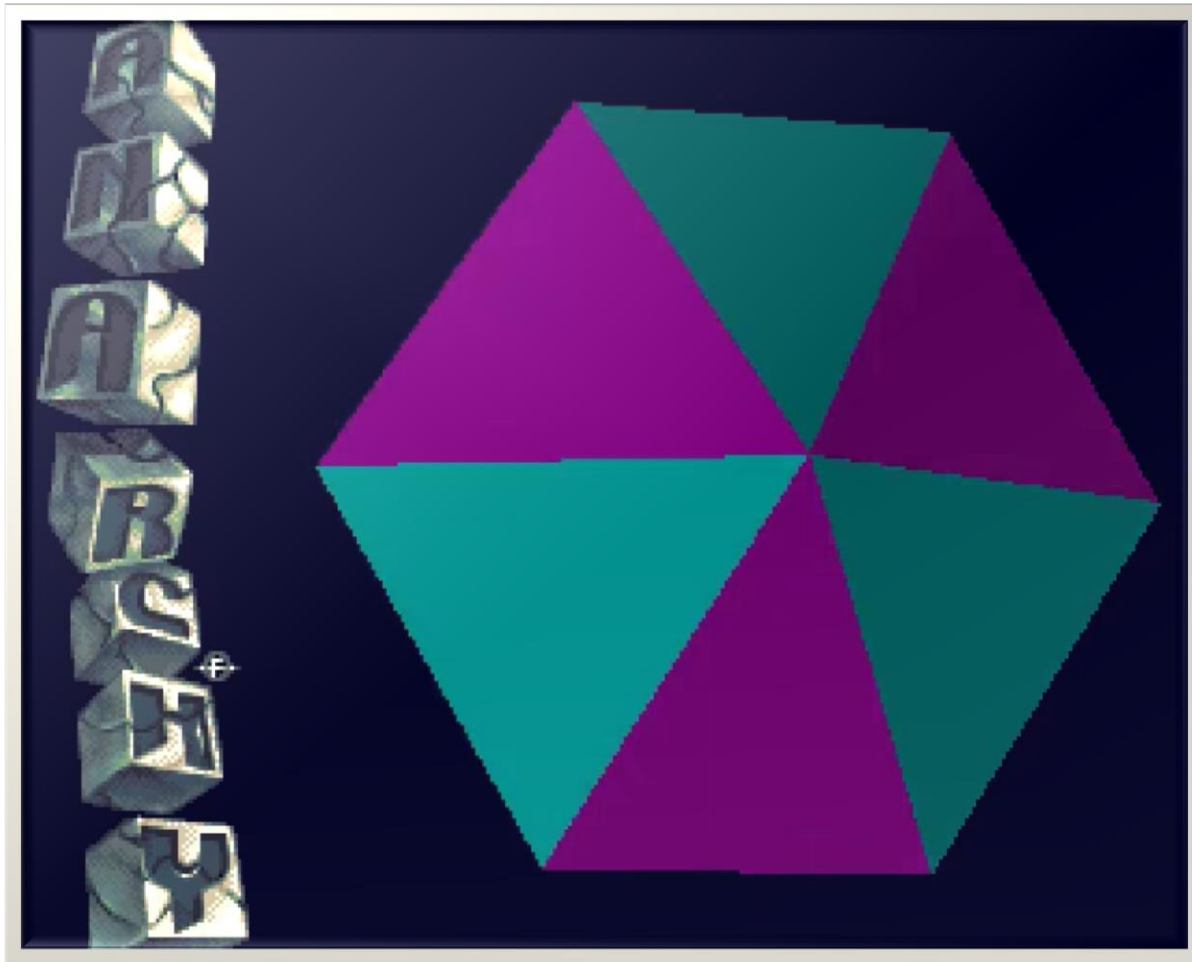
# Blitter Line Drawing

Solid lines

One pixel per scanline

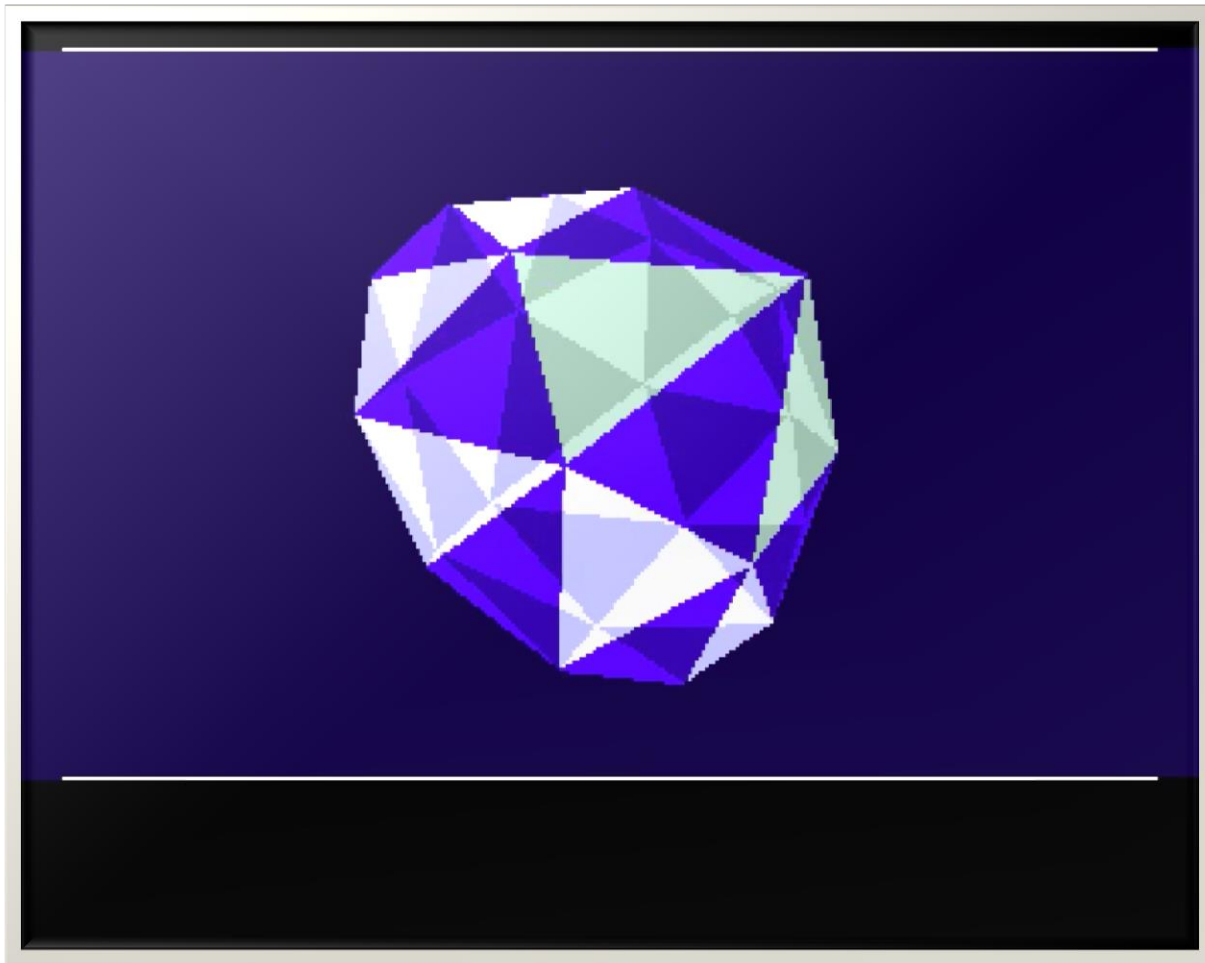


# Effect: Filled Vector



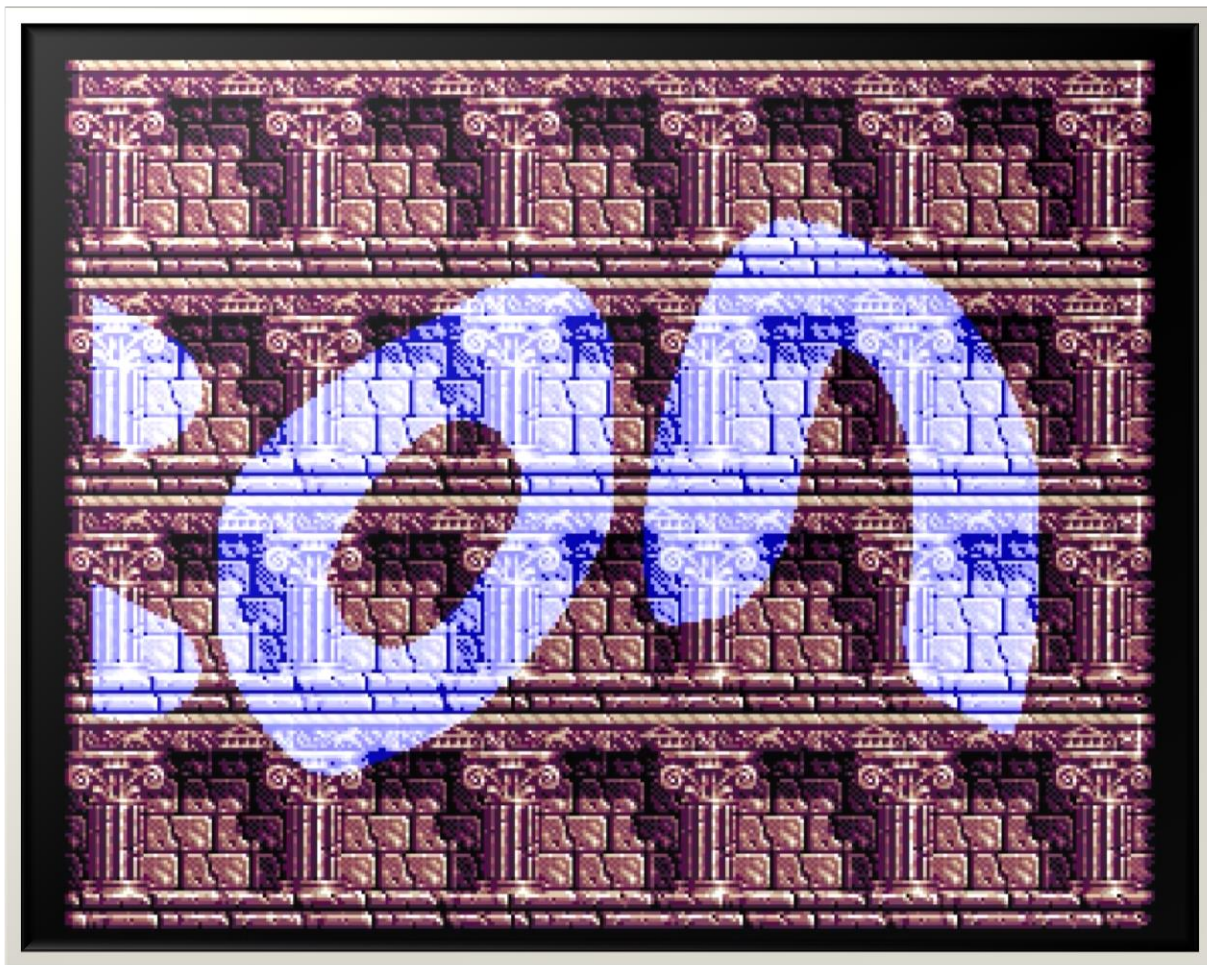
From "Seeing is Believing" by Anarchy, 1991

# Effect: Glenz Vector



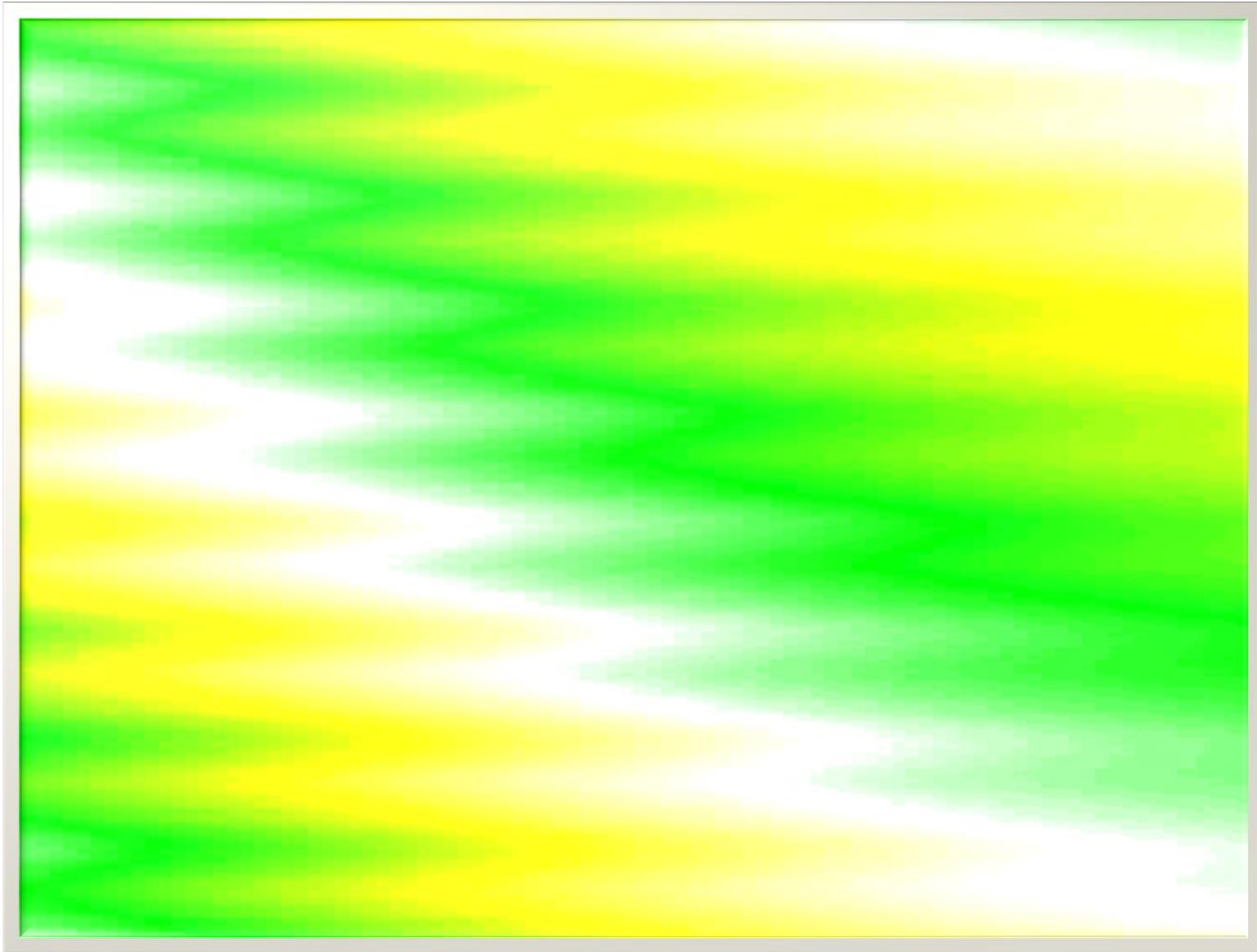
From "Hardwired" by Crionics, 1991

# Effect: Vertical Filling



From "World of Commodore" by Sanity, 1992

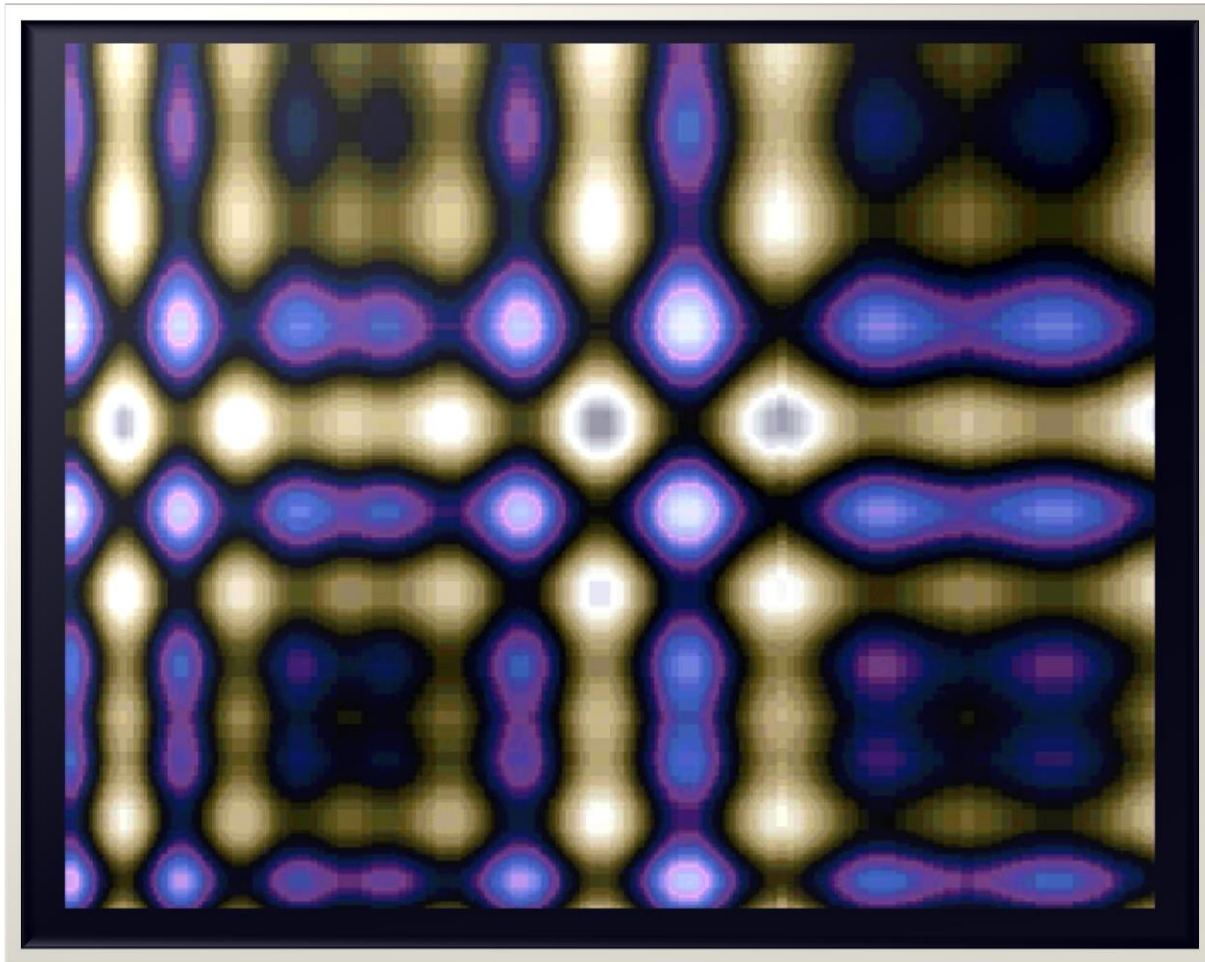
# Effect: Plasma



From "Overdose" by Delight, 1991

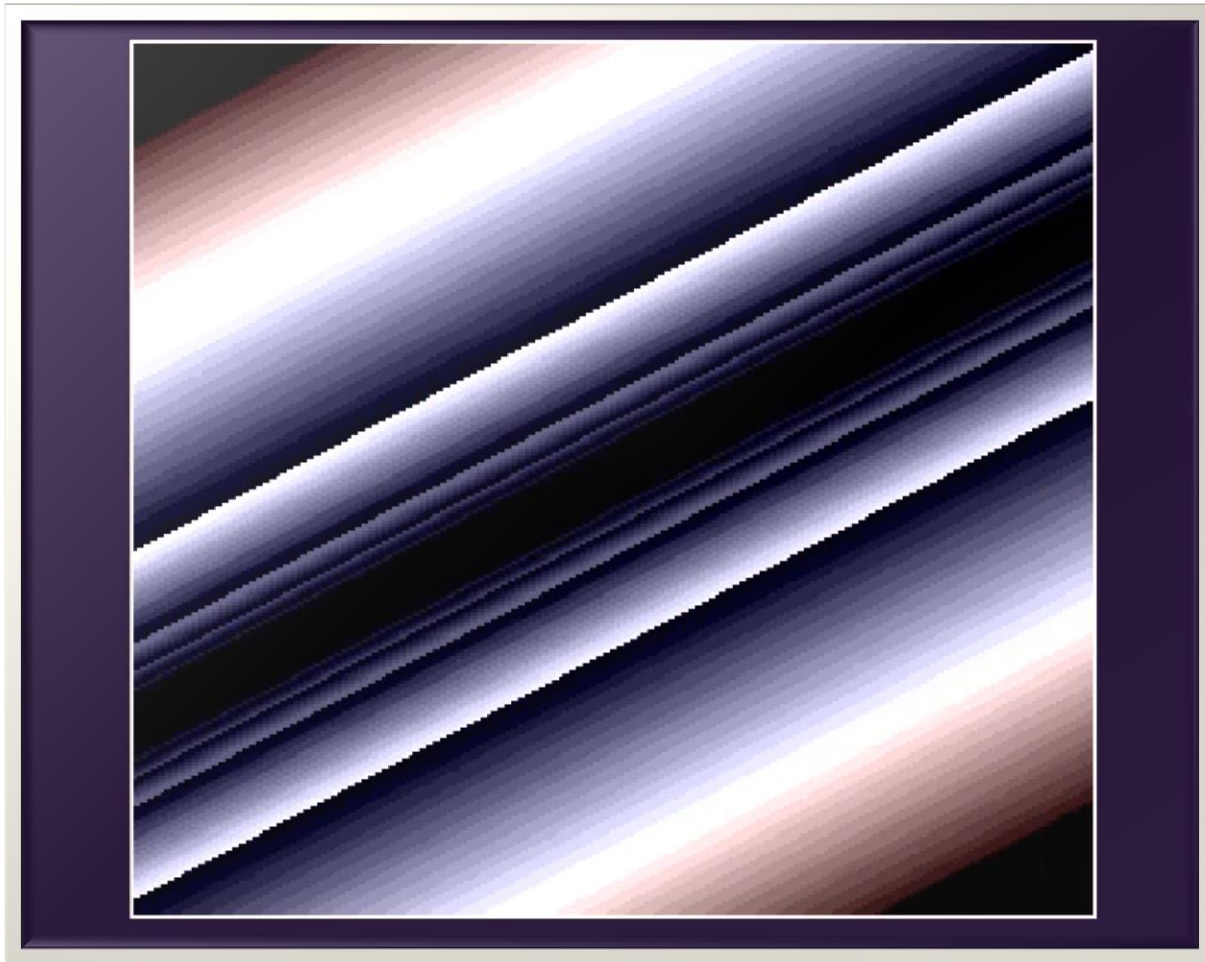


# Effect: Sine Plasma



From "Arte" by Sanity, 1993

# Effect: Raster Tunnel



From "Interference" by Sanity, 1993



# List of demos

- Copper Master by Angels, 1990
- Mesmerized by Pure Metal Coders, 1990
- Overdose by Delight, 1991
- Seeing is Believing by Anarchy, 1991
- Hardwired by Crionics, 1991
- World of Commodore by Sanity, 1992
- Desert Dream by Kefrens, 1993
- Interference by Sanity, 1993
- Bananamen by Stellar, 1993
- Arte by Sanity, 1993





The End

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