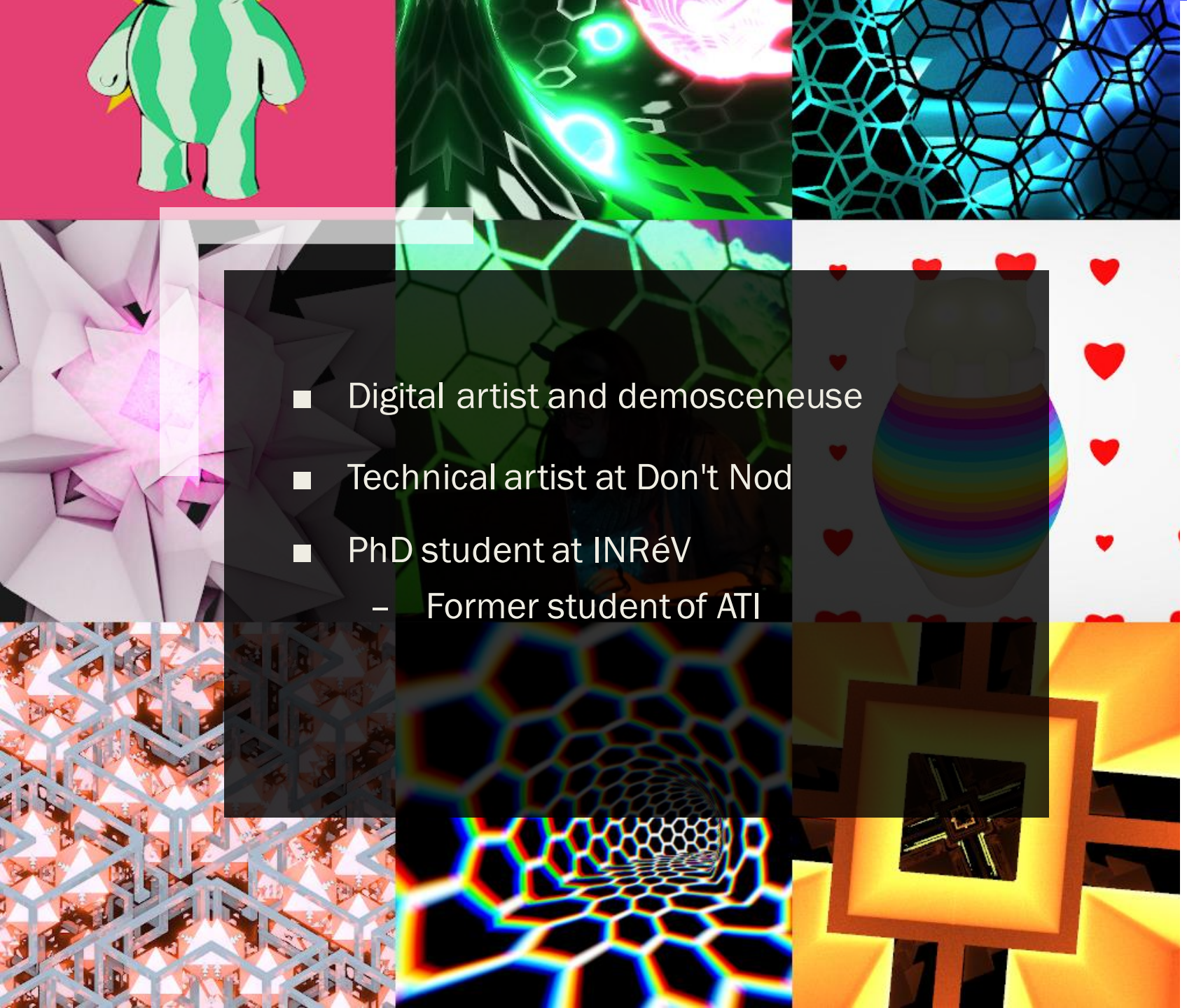
CREATE WITH CODE ON HARDWARE

Florine 'Flopine' Fouquart



- Digital artist and demosceneuse
- Technical artist at Don't Nod
- PhD student at INRéV
  - Former student of ATI

DON'T NOD

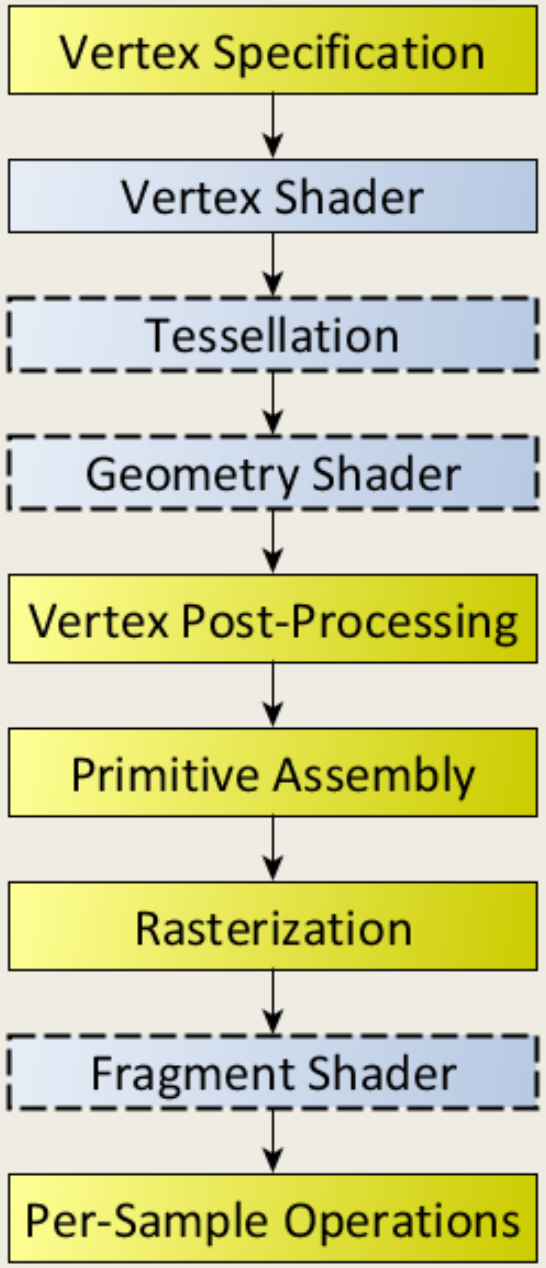
LABORATOIRE
ARTS DES IMAGES & ART CONTEMPORAIN
INREV
IMAGE NUMERIQUE & REALITE VIRTUELLE

CREATE WITH CODE…

- Processing
  - The coding train
- ThreeJS
- Python
  - PIL ou Pillow
- Shaders
- Etc….

three.js

Shadertoy



DirectX XII ULTIMATE → HLSL

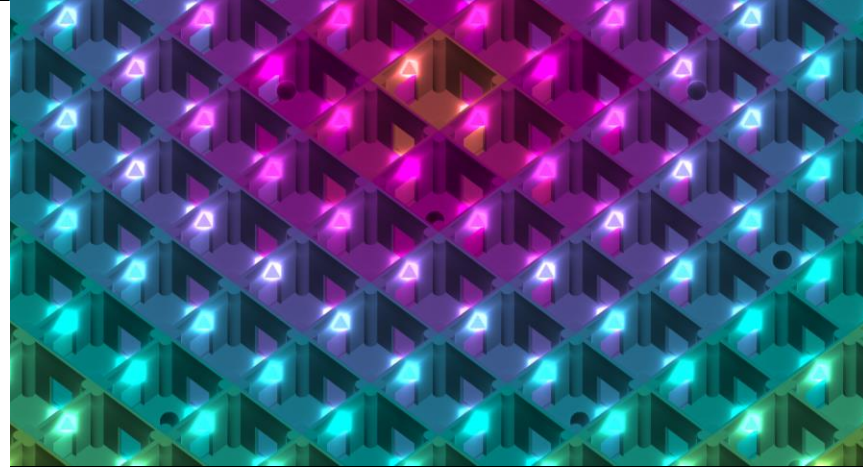
OpenGL → GLSL

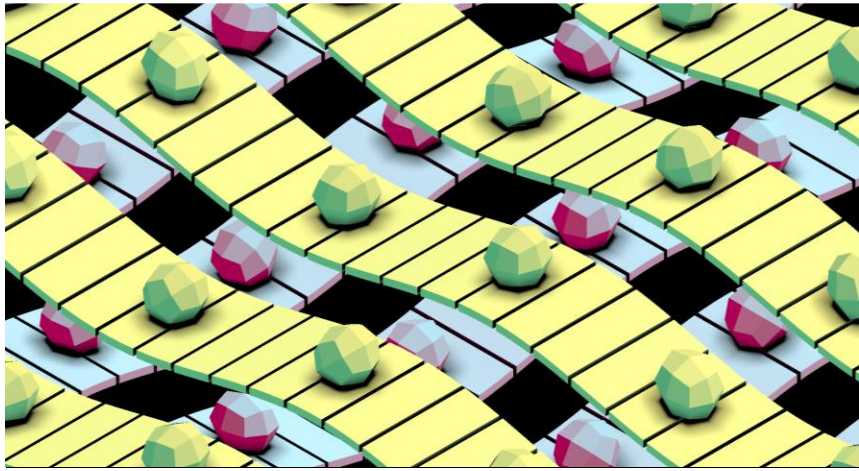
Vulkan → SPIR-V

Metal

- Solo practice : Shadertoy
- Live practice : Twitch
- Competition : Shader Showdown

- Follow me : @FlopineYeah





SOFTWARE RESOURCES

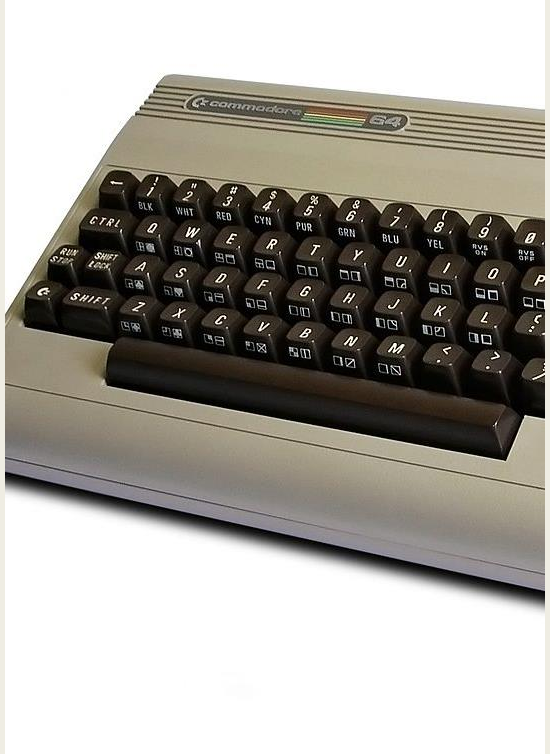
Shadertoy - online
GLSL Sandbox - online
Bonzomatic - offline
Kodelife - offline
Shader Editor - offline for Android

LEARNING RESOURCES

The Book of Shaders - Patricio Gonzalez and Jen Lowe
Pixel Spirit Deck - Patricio Gonzalez
Inigo Quilez website
The Art of Code Youtube Channel - BigWings

TWITCH RESOURCES

BlackleMori
Evvvvil_
Flopine
FMS_Cat
LunaSorcery
Nusan_fx
Rimina_

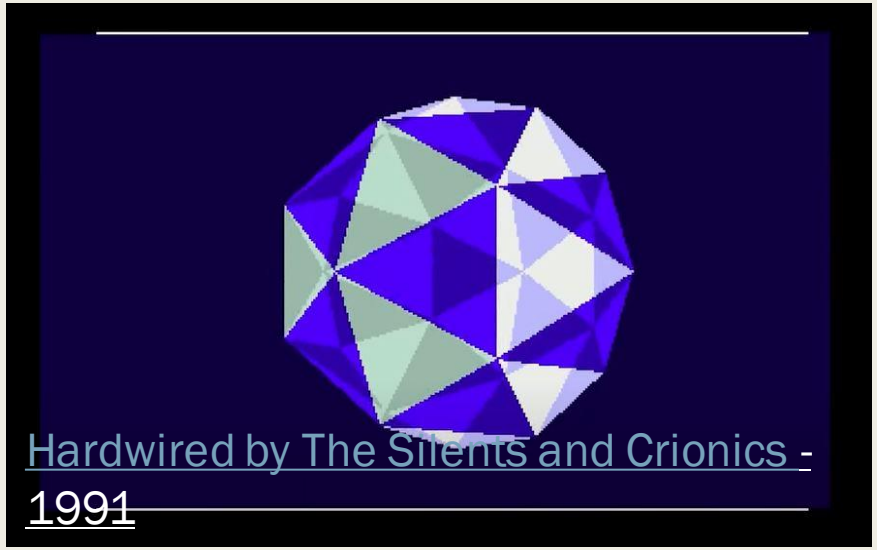


… ON HARDWARE

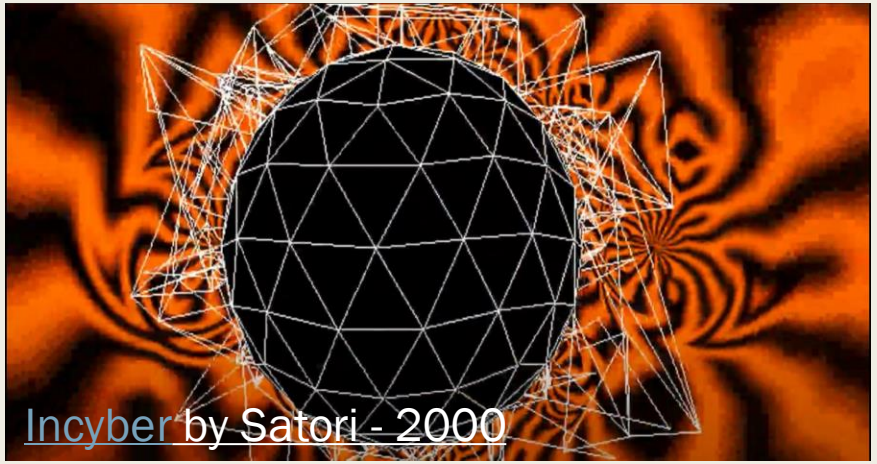
Quick history of the demoscene

Combat School Crack by Fairlight - 1987

- 8-bit era (Atari 400, C64, ZXSpectrum)
  - Cracked games and intros


Hardwired by The Silents and Crionics - 1991

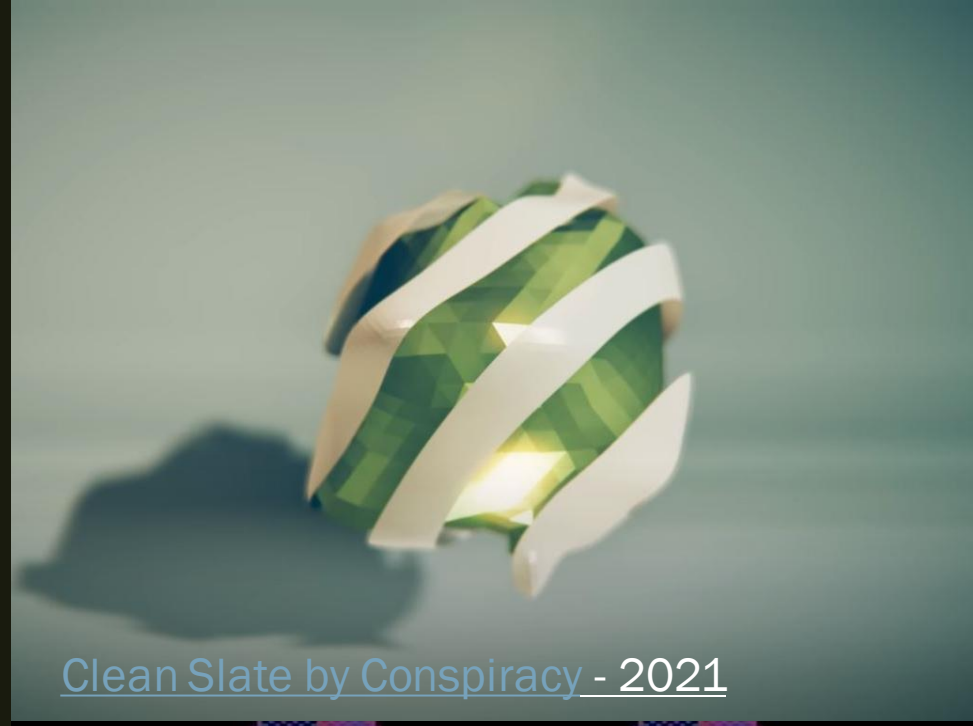
- 16-bit era (Atari ST, Amiga AGA)
  - Render engine and demos


Incyber by Satori - 2000

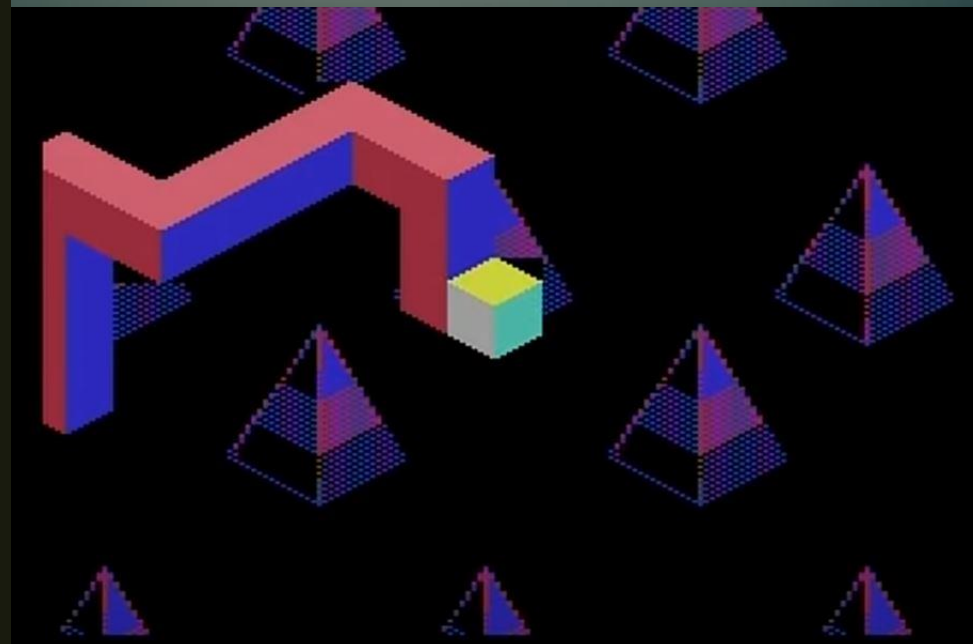
- 32/64-bit era
  - Abstraction and hacking creativity

Demoscene today:

- Community with a culture
- Friendly competitions
- Making old computers still a thing



Clean Slate by Conspiracy - 2021



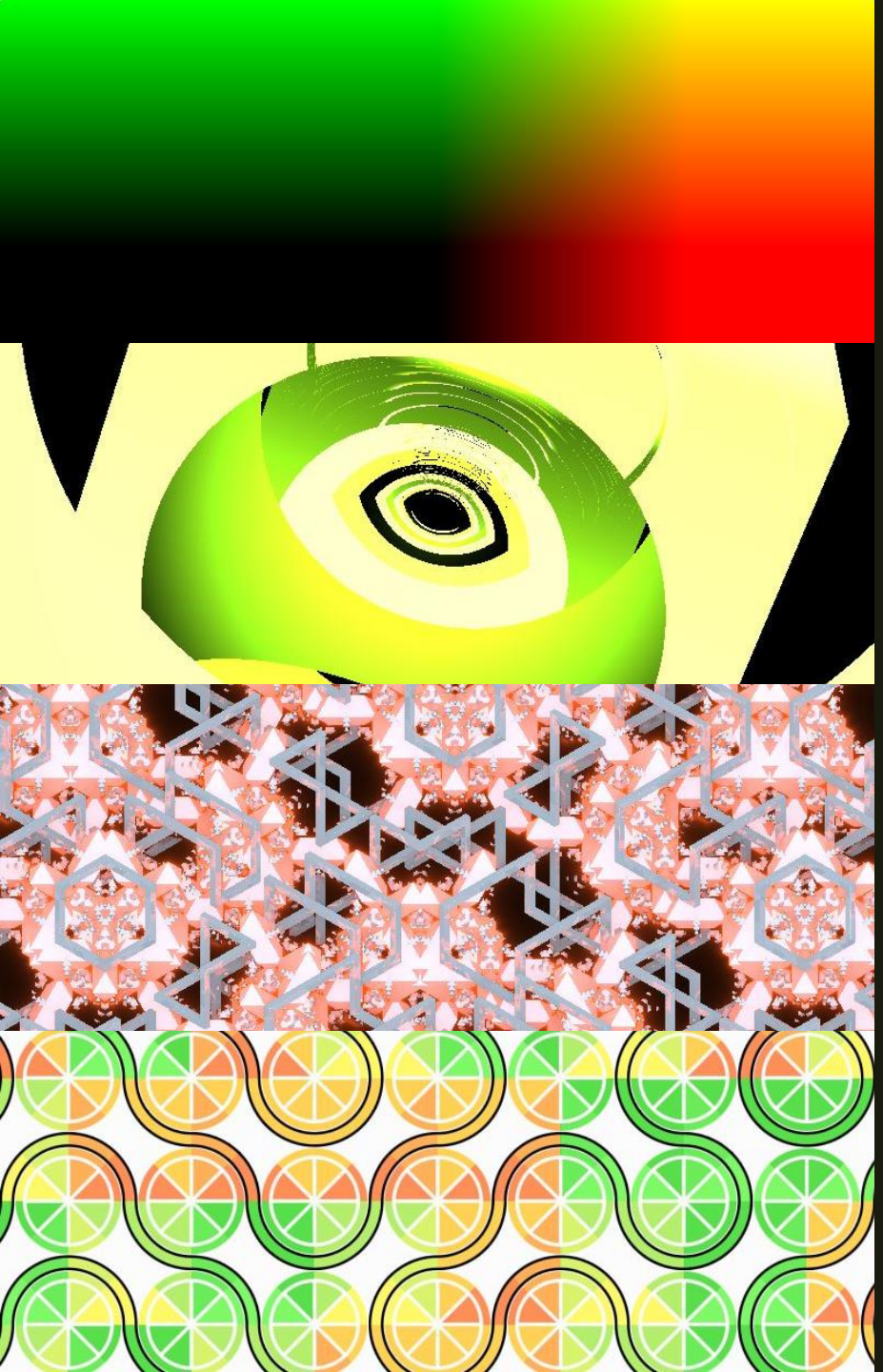
Old men in used cars by Fossil - 2018

CREATE ON HARDWARE

Some Amiga 500 specifications:

- ASM 68000 (68k)
- 7.1MHz CPU without cache
- 512 Kbytes of RAM
- From 320×256 to 640×512 pixels for screen resolution
- From 2 to 32 colours (not 256)
- Chipsets dedicated to display and sound instructions
- Limited number of registers

Hardwired by The Silents and Crionics - 1991



In practice:

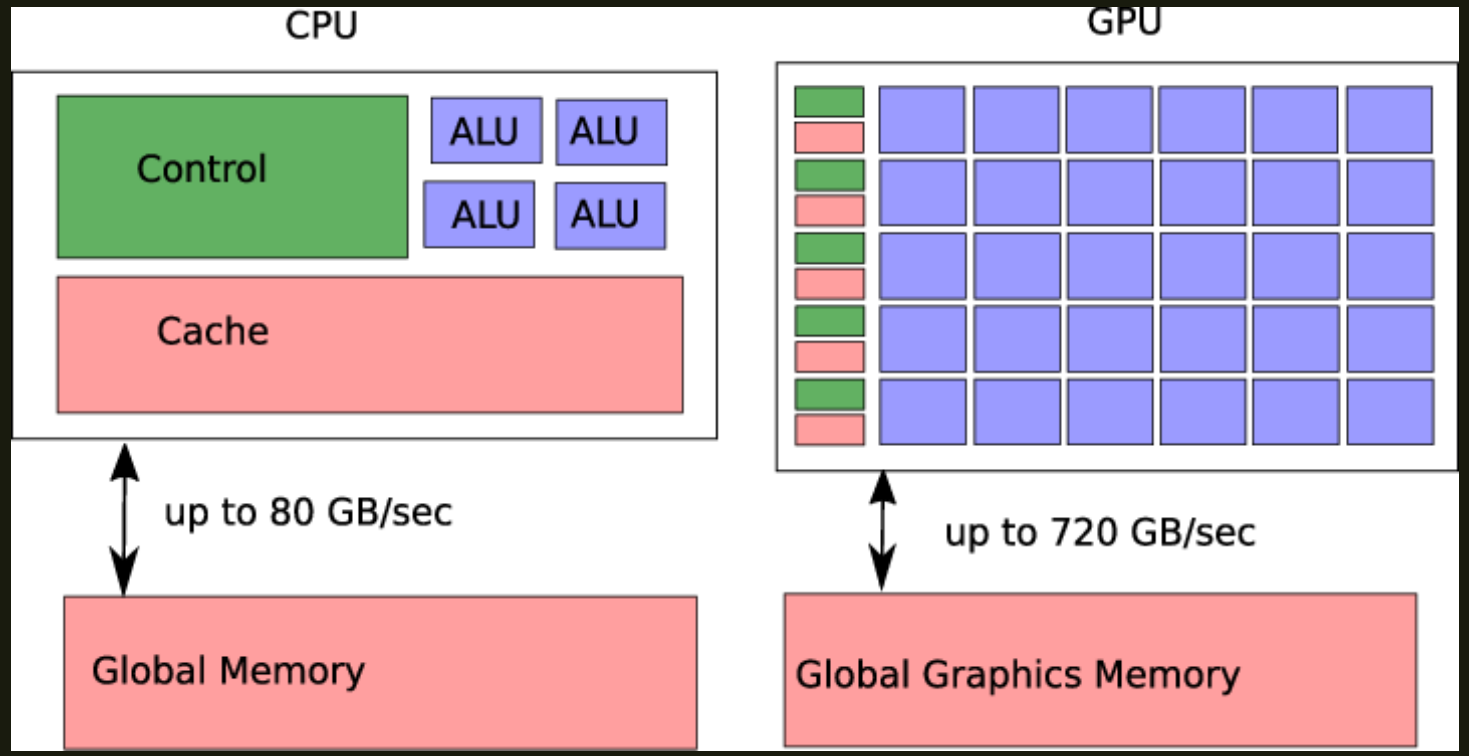
Adaptation to limitations = learning

↓

Getting around limitations = hacking, playing

↓

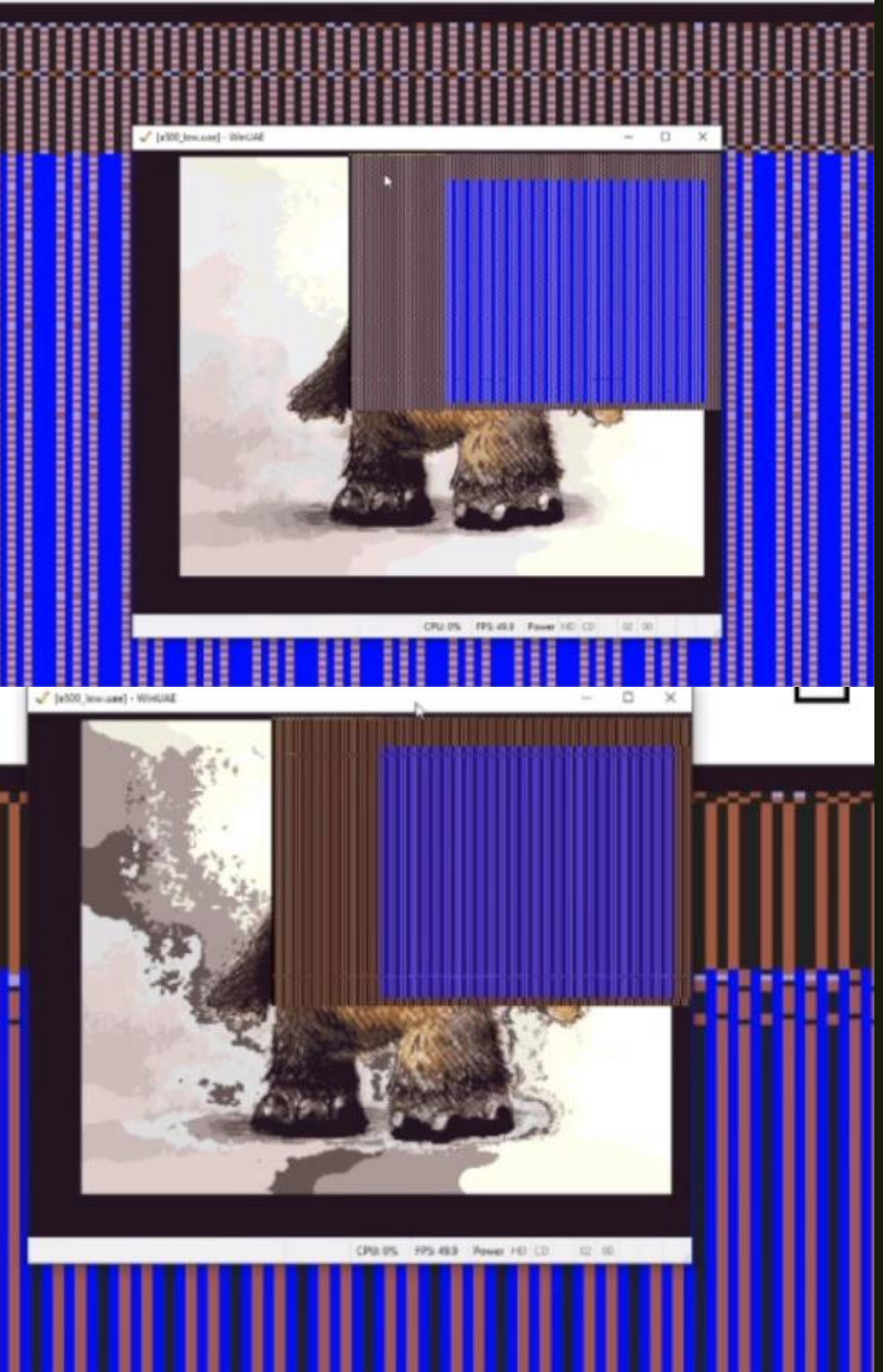
Create new limitations = keep going



OPTIMISATION EXAMPLES

Precalculated render:

- CPU = small buckets
  - Not so good with parallelisation
  - Lot of cache
  - Access to global memory
- GPU = large buckets
  - Good with parallelisation
  - Not so good at exchanging information
  - Access to graphics memory



Amiga 500 and bitplanes:

- 1 pixel isn't a "bag" of 1 byte for each three channels
- 1 pixel is described with 1 bit per bitplane to form a binary index to fetch a color in a palette
  - First bitplane represents the least significant bit
  - The more bitplanes you add, the more nuance you would be able to display
  - When the image is monochrome, only one bitplane is necessary.
    It means that for colouring 16 pixels it just need 16 bits of memory

GLSL code golfing:

- float a; float b; float c...

  ↓

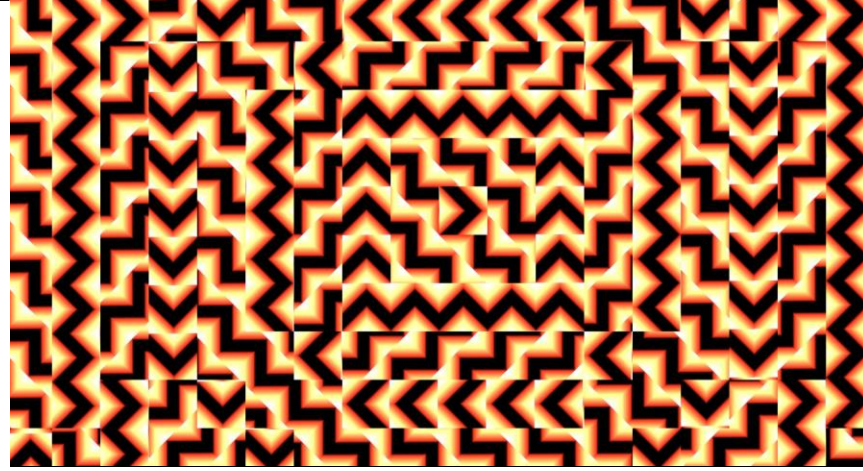
  float a,b,c;

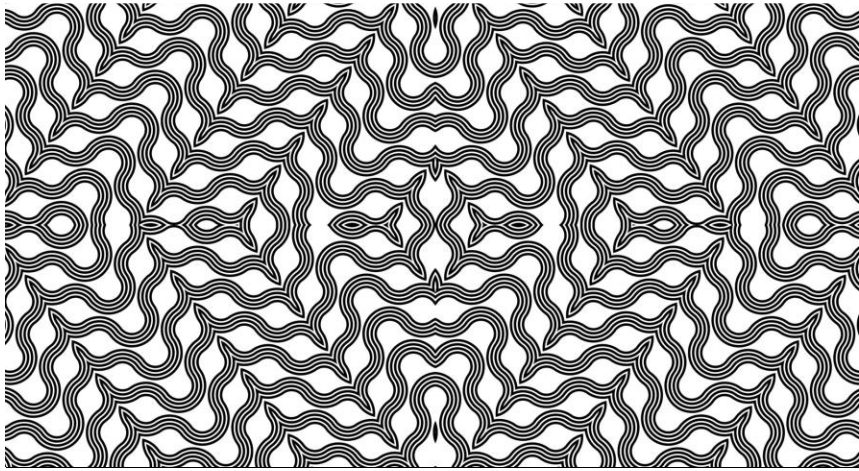
- A = pi/2

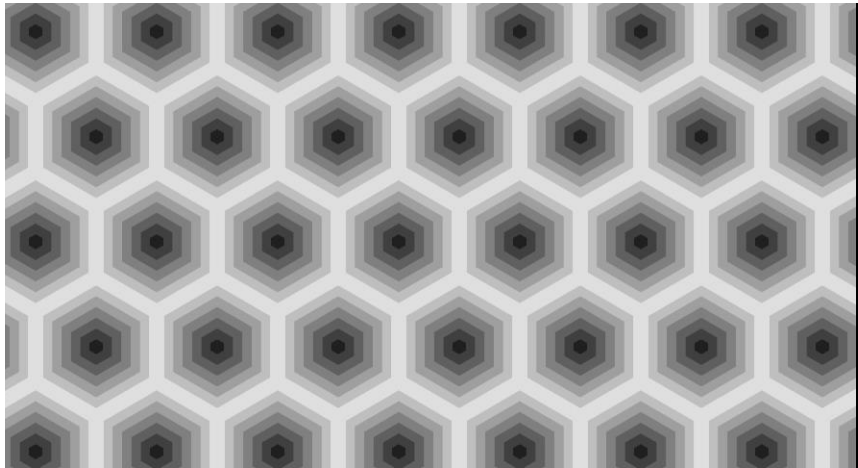
mat2(cos(A), -sin(A), cos(A), sin(A))

↓

mat2(cos(1.047-vec4(0,33,11,0)))







THANK YOU!