image from: http://www.iryoku.com/screen-space-subsurface-scattering

Computer Graphics

Introductions

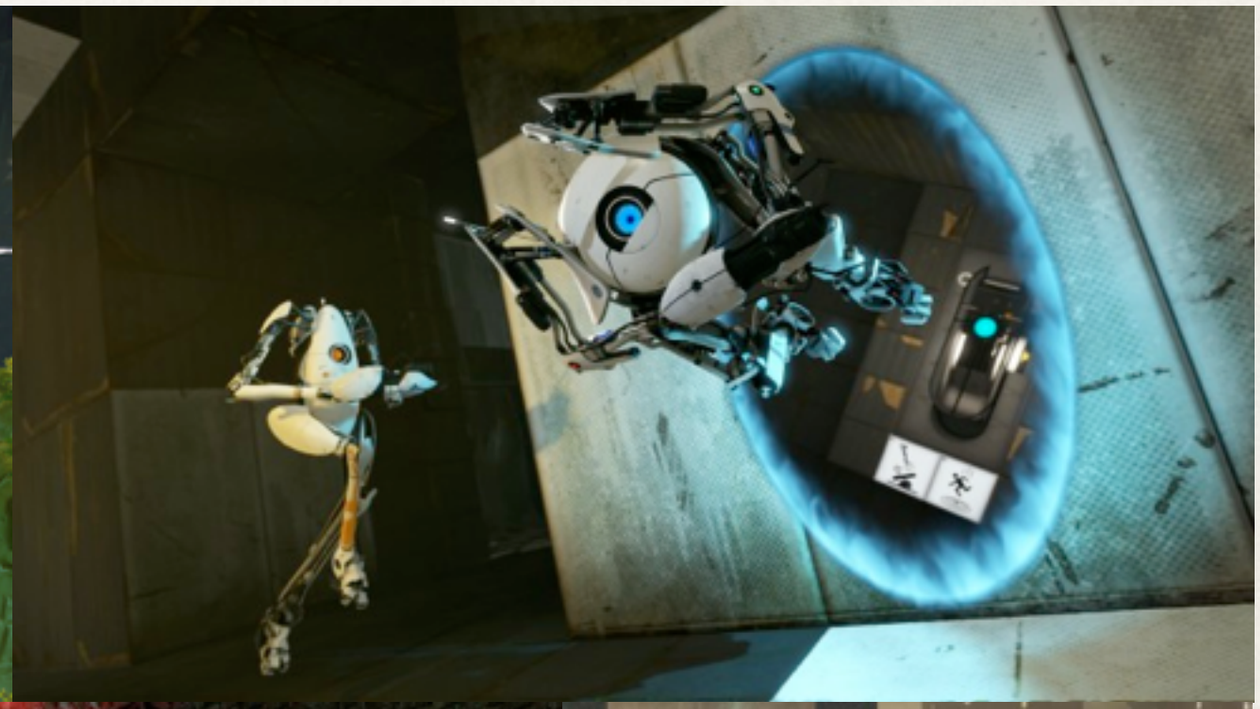
12 September 2016

Computer Graphics

- **Imaging** - storage and representation of 2D images
- **Modeling** - storage and representation of 3D objects
- **Rendering** - transformation of 3D models to 2D representations
- **Animation** - displaying changes to models over time

Image processing

Games



images counter-clockwise from top left: StarCraft 2 - Blizzard, Portal 2 - Valve, Batman: Arkham City - Rocksteady Studios, Sauerbrauten - dot3 labs, FIFA 12 - EA Games

Serious gaming

images counter-clockwise from top left: America's Army - United State Army, First Person Cultural Trainer - University of Texas, Unknown health simulation

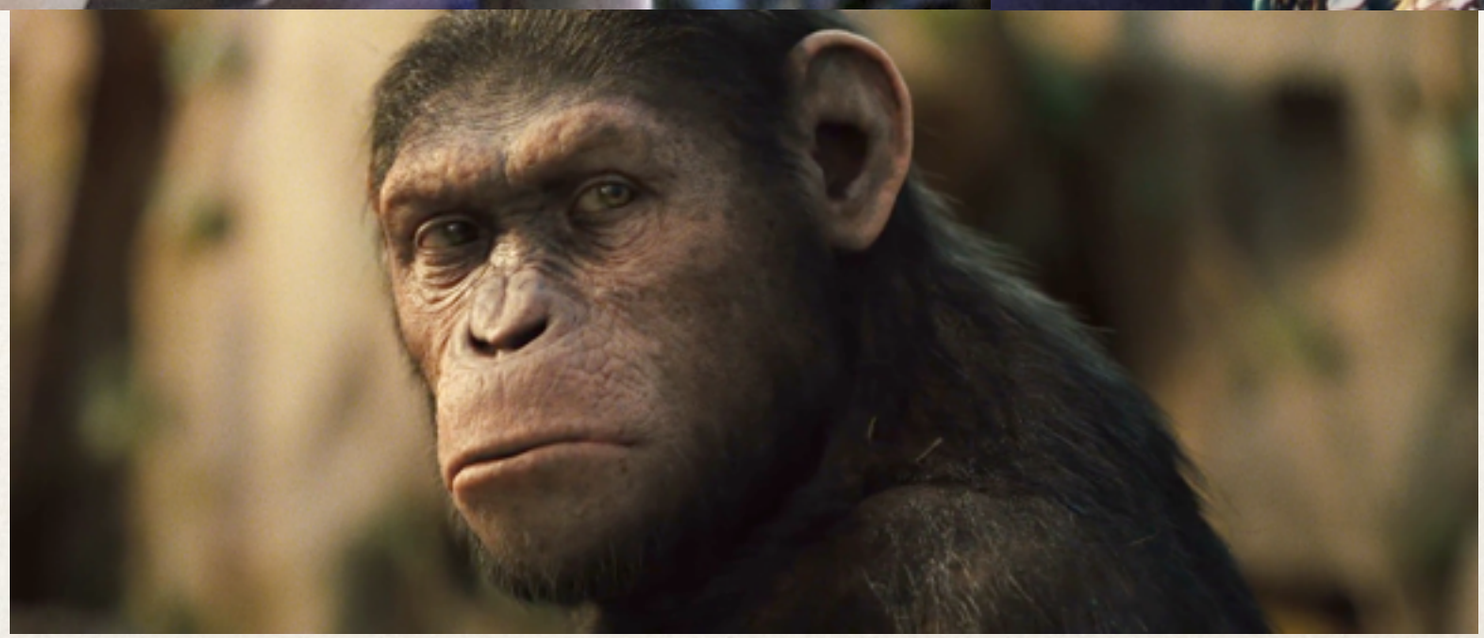
Film: Animation

images counter-clockwise from top left: Toy Story - Pixar, Shrek - DreamWorks, Wall-e - Pixar, How to Train Your Dragon - DreamWorks

Film: Special Effects

images counter-clockwise from top left: Fellowship of the Rings - New Line Cinema, Attack of the Clones - LucasFilm, District 9- TriStar Pictures, The Matrix - Warner Bros. Pictures

Film: Virtual Actors



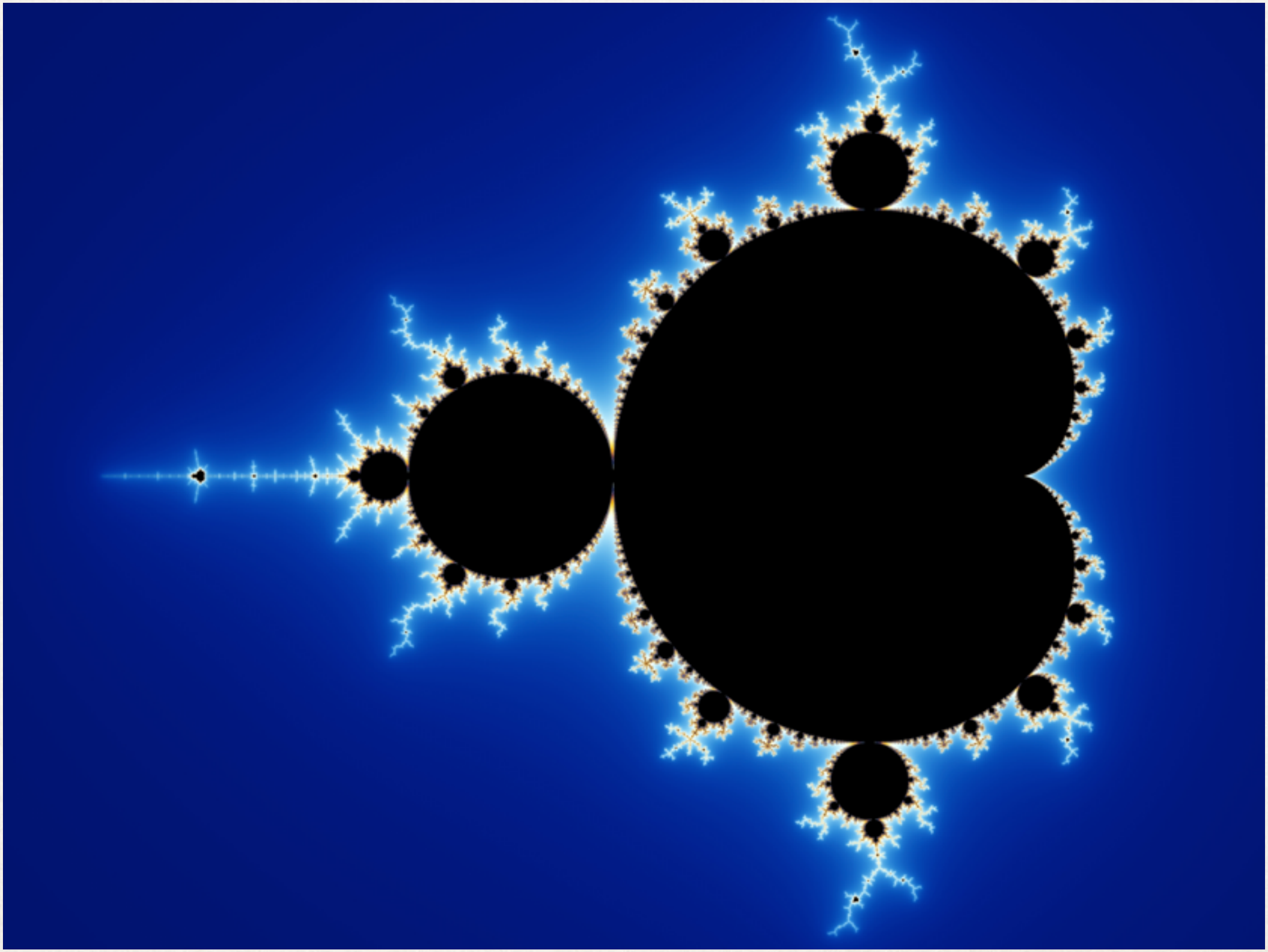
images clockwise from top left: Return of the King - New Line Cinema, Avatar - 20th Century Fox, The Rise of the Planet of the Apes - 20th Century Fox

Film: Virtual Actors

Virtual people?

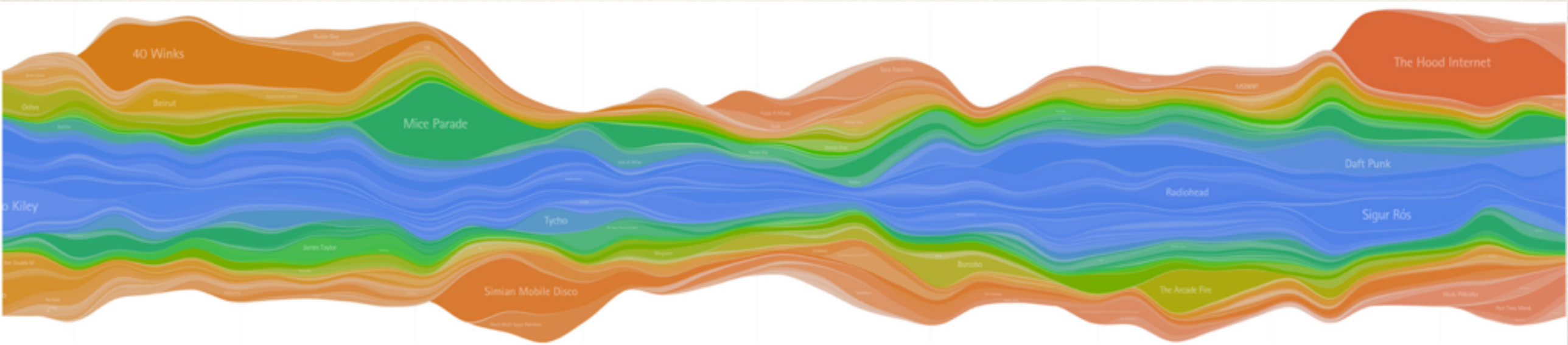
Virtual people?

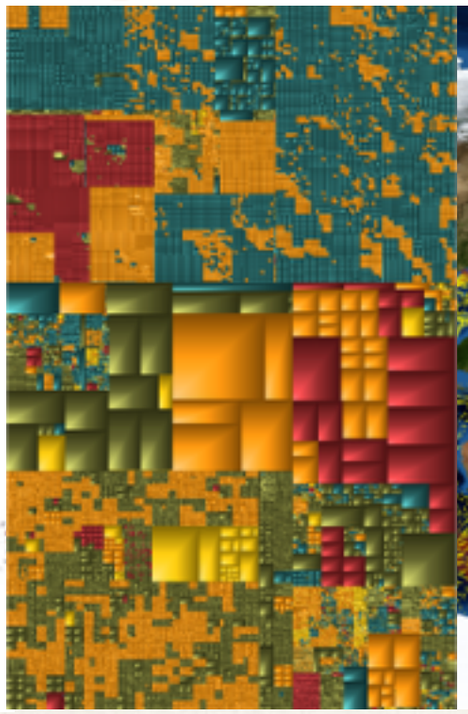
Mathematics

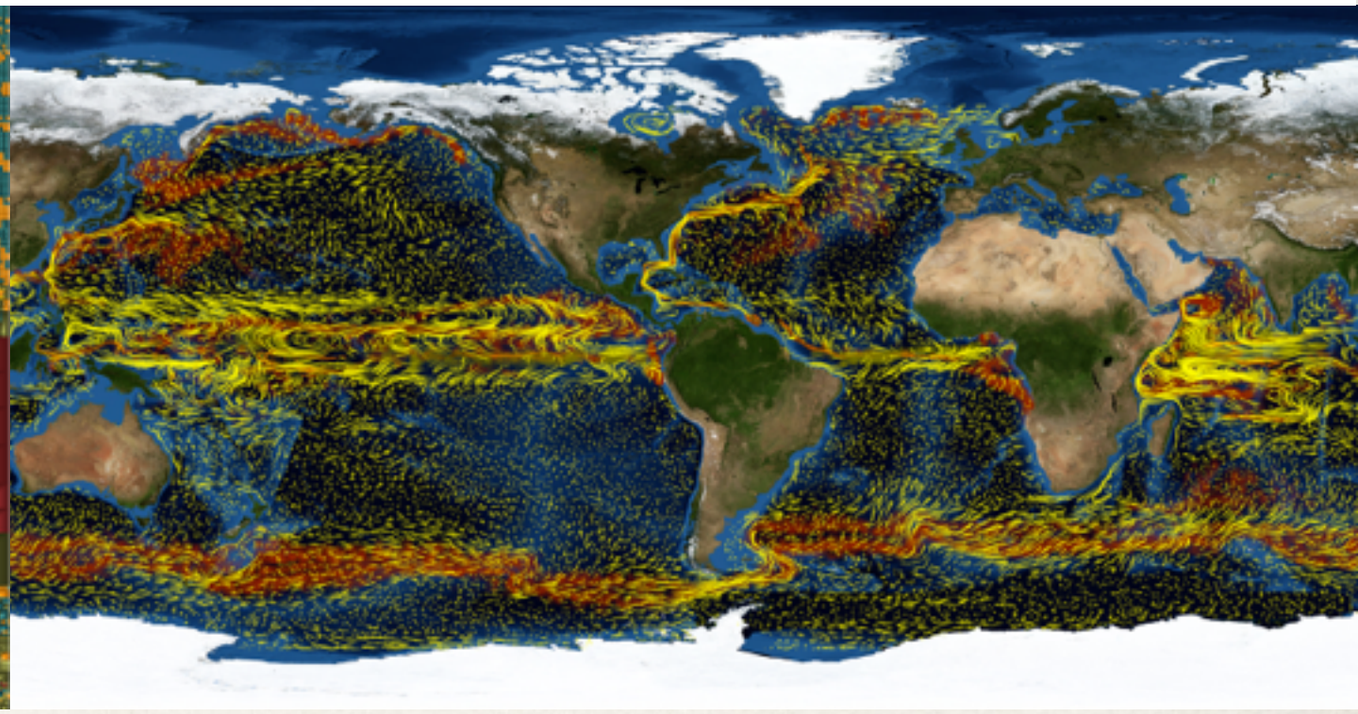


Created by Wolfgang Beyer with the program Ultra Fractal 3

Information visualization

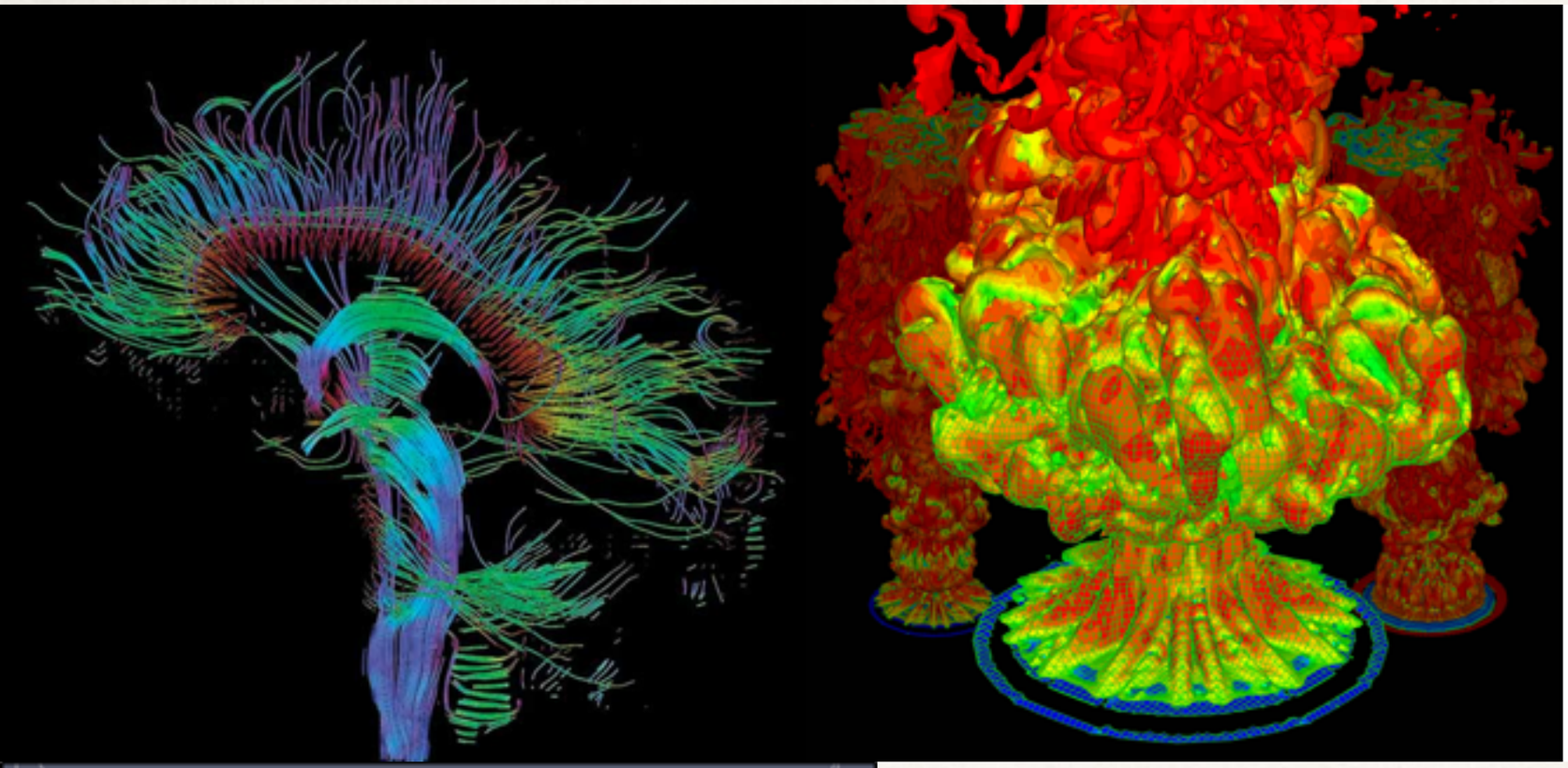


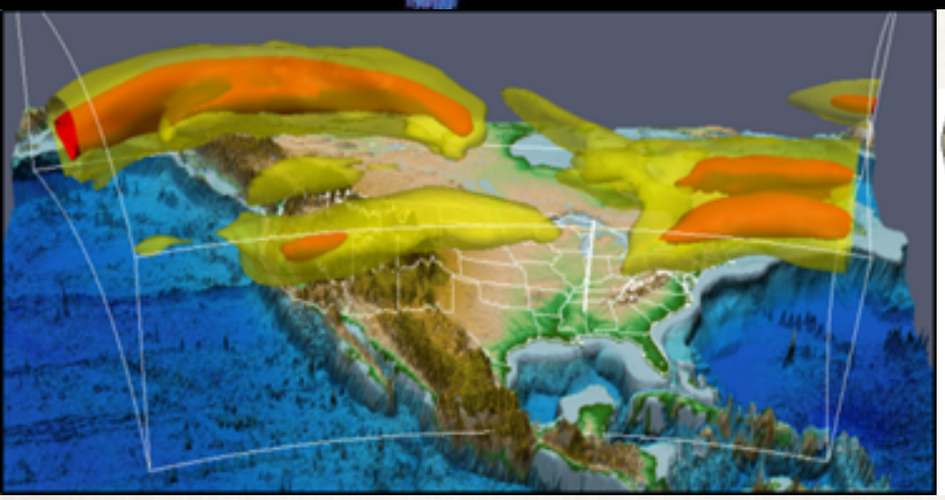


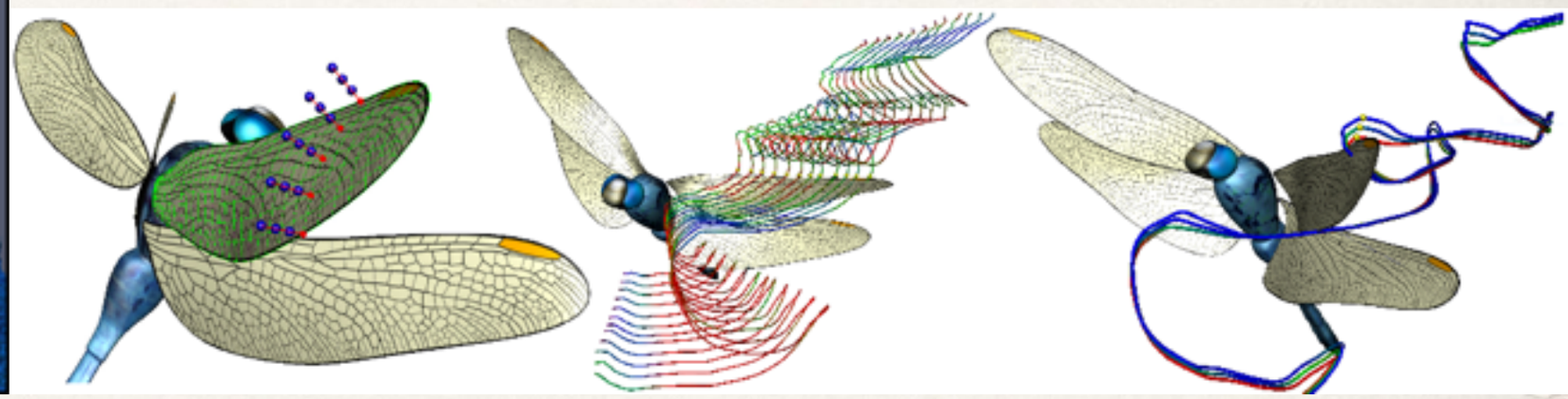


Clockwise from top: Stacked graph, Byron and Wattenberg; 2D Current, Ware; Treemap, Grand Perspective; Network diagram.

Scientific visualization

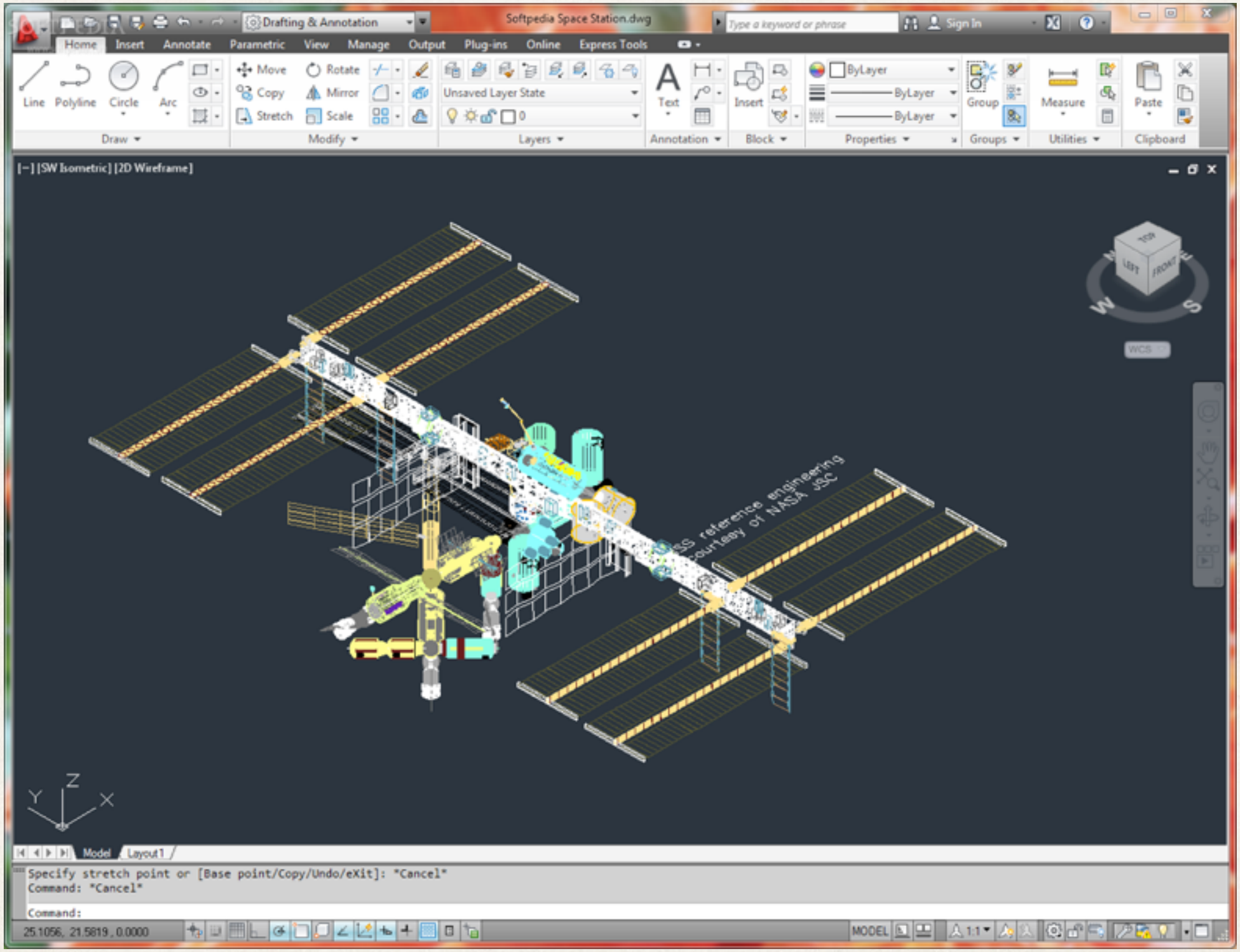






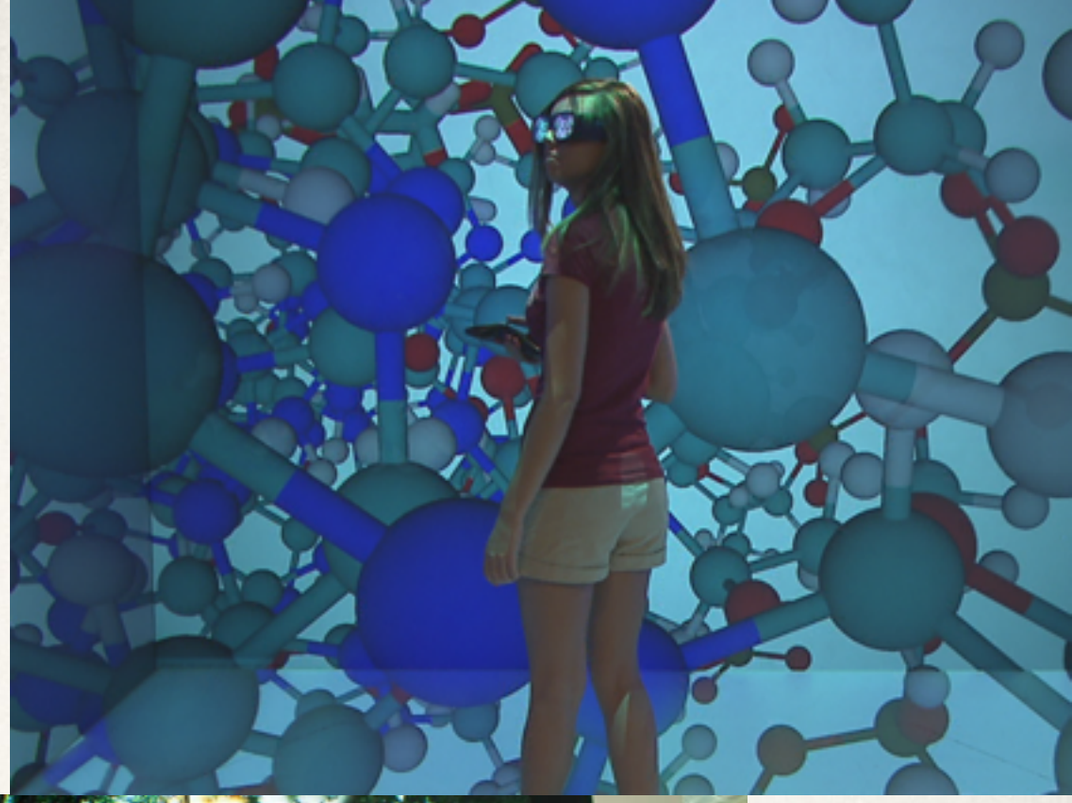
Clockwise from top left: Brain pathways, Constandi; Fluid dynamics, DesJardin; Volume visualization, Guo et al.; Vortex visualization, Koehler et al.; ZoomRadar

Computer-aided design



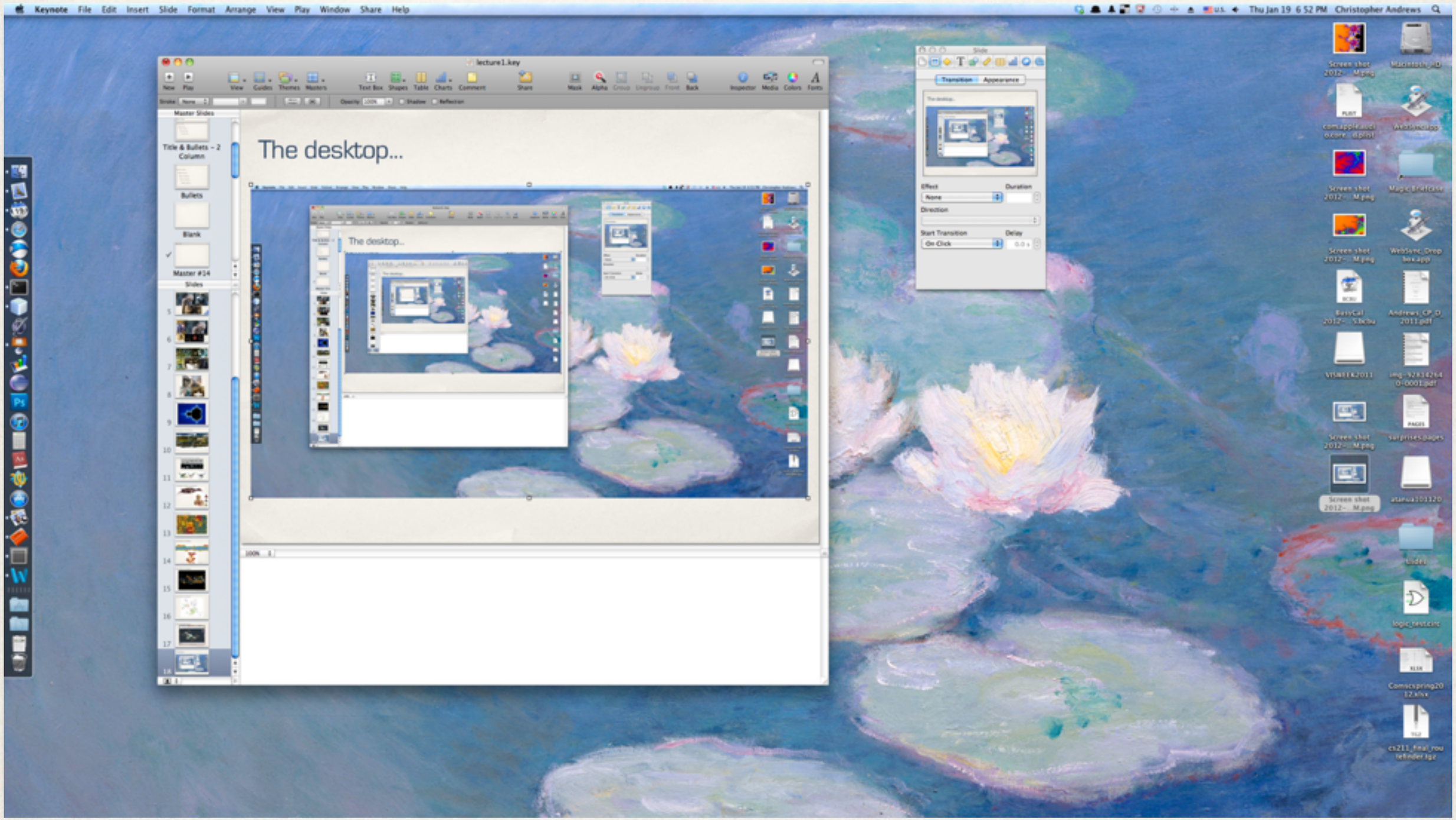
AutoCAD screenshot from http://www.softpedia.com/progScreenshots/AutoCAD-Screenshot-104603.html

Virtual/augmented reality



Clockwise from top left: Virtusphere; Cave at VT; Oculus Rift with Myo armband; Pokemon Go; Google Cardboard

The desktop...


Keynote File Edit Insert Slide Format Arrange View Play Window Share Help
Thu Jan 19 6 52 PM Christopher Andrews
lecture1.key
The desktop...
Title & Bullets - 2 Column
Bullets
Blank
Master #14
Slides
Slide
Transition
Appearance
Effect
Duration
None
Direction
Start Transition
Delay
On Click

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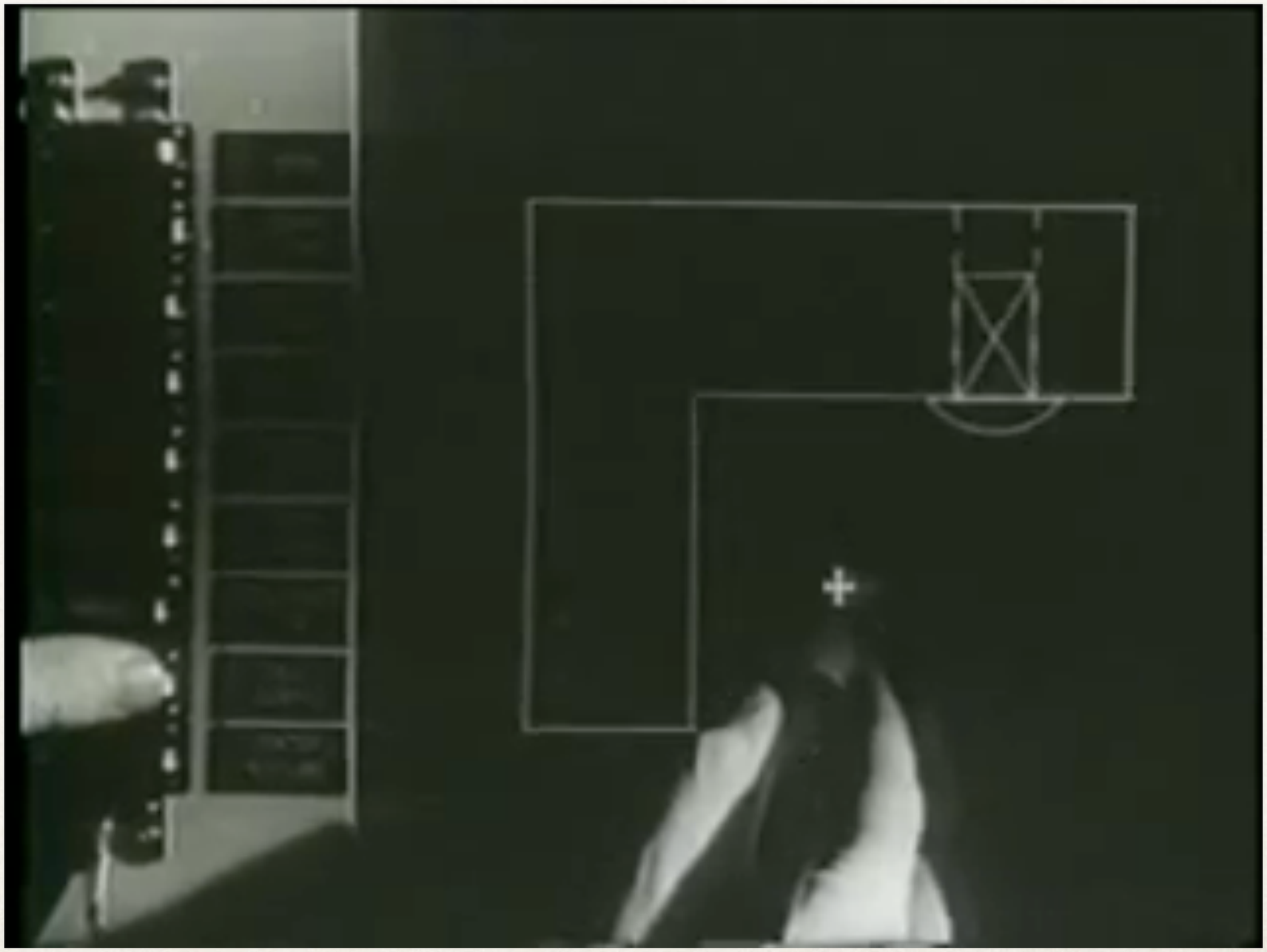
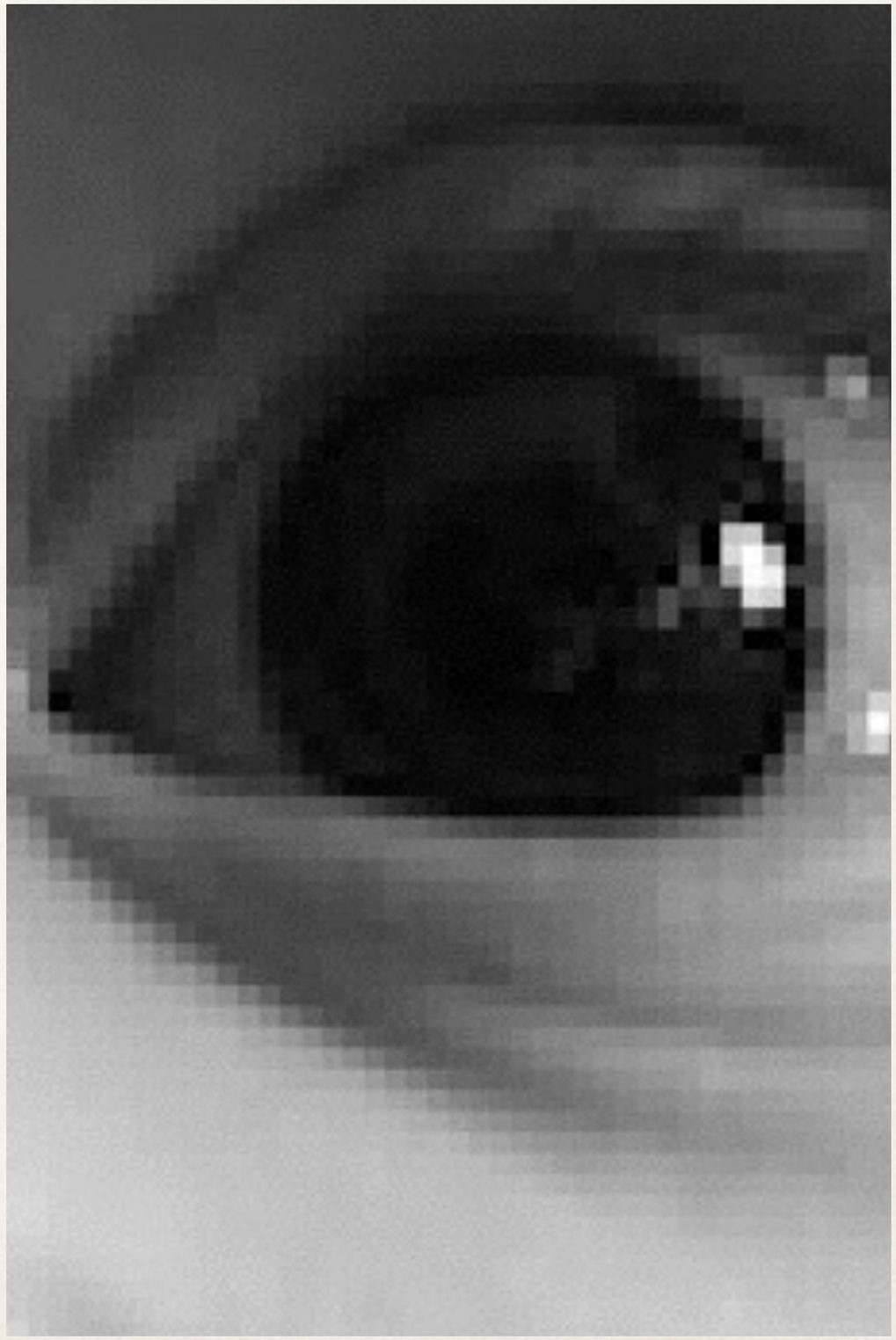
Back to the beginning

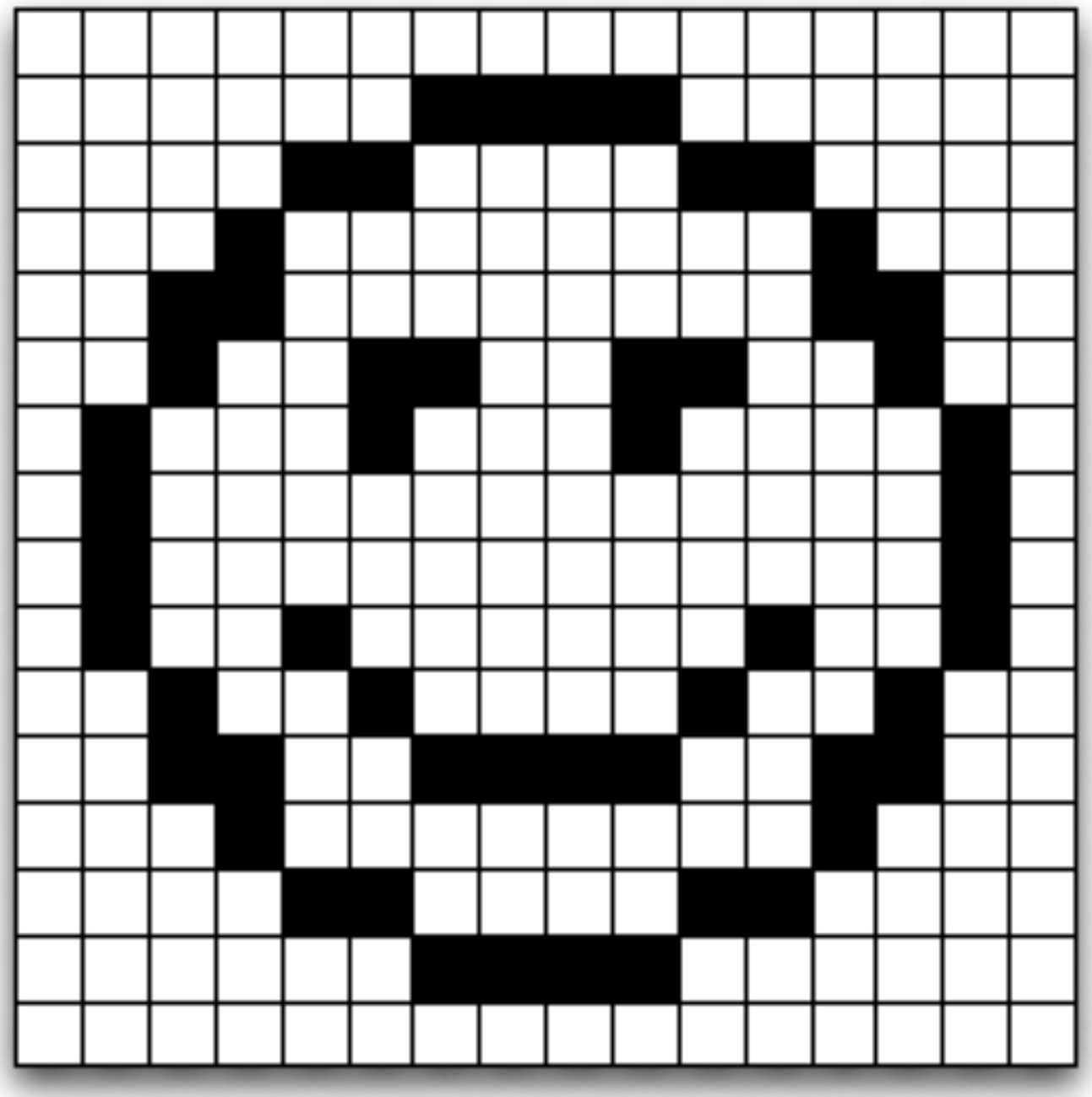
Ivan Sutherland's Sketchpad



Raster images



Bitmap



1	1	1	1	1	1	1	1
1	1	1	1	1	1	0	0
1	1	1	1	0	0	1	1
1	1	1	0	1	1	1	1
1	1	0	0	1	1	1	1
1	1	0	1	1	0	0	1
1	0	1	1	1	0	1	1
1	0	1	1	1	1	1	1

Pixel depth

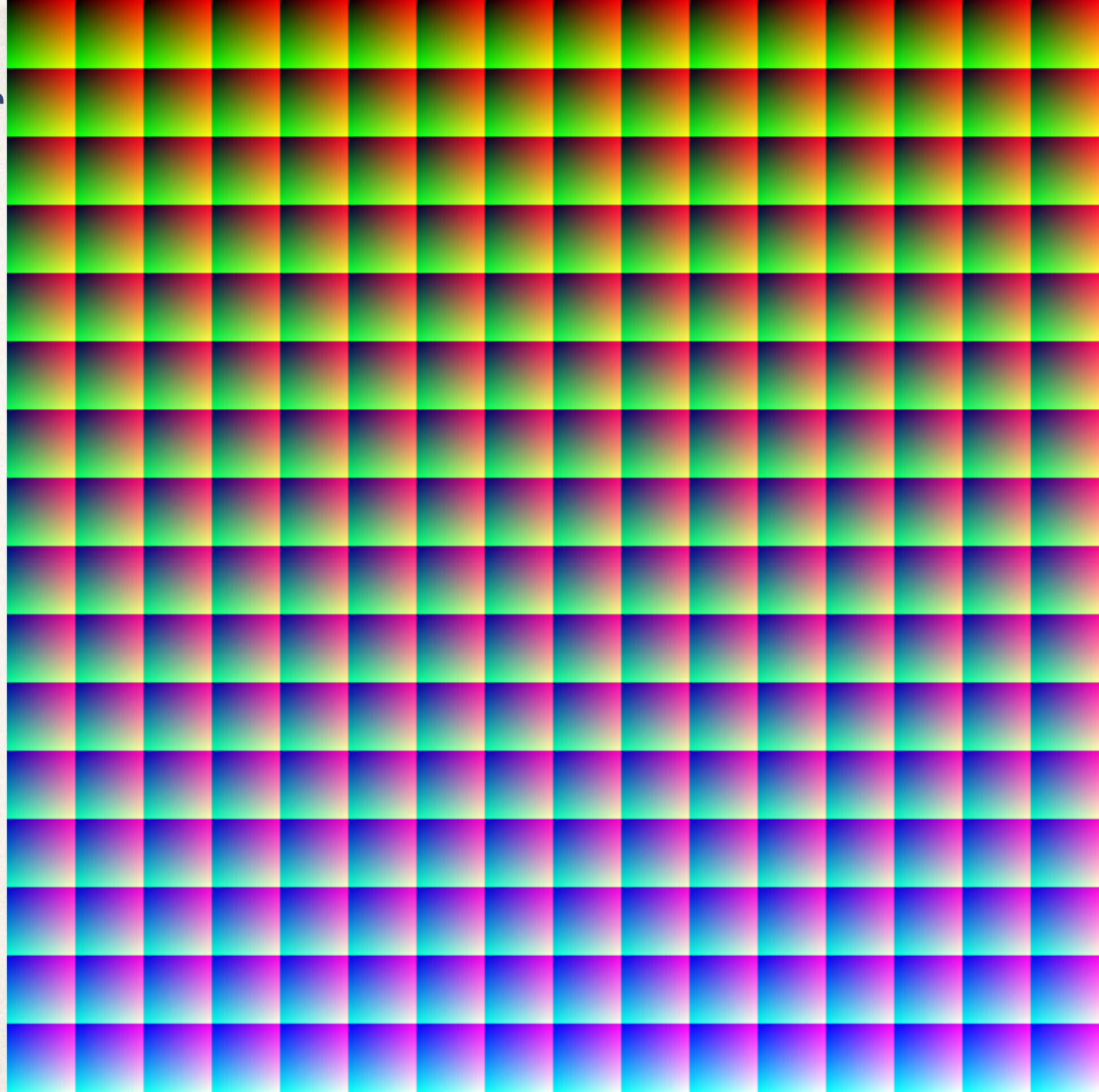
8 bit

4 bit

2 bit

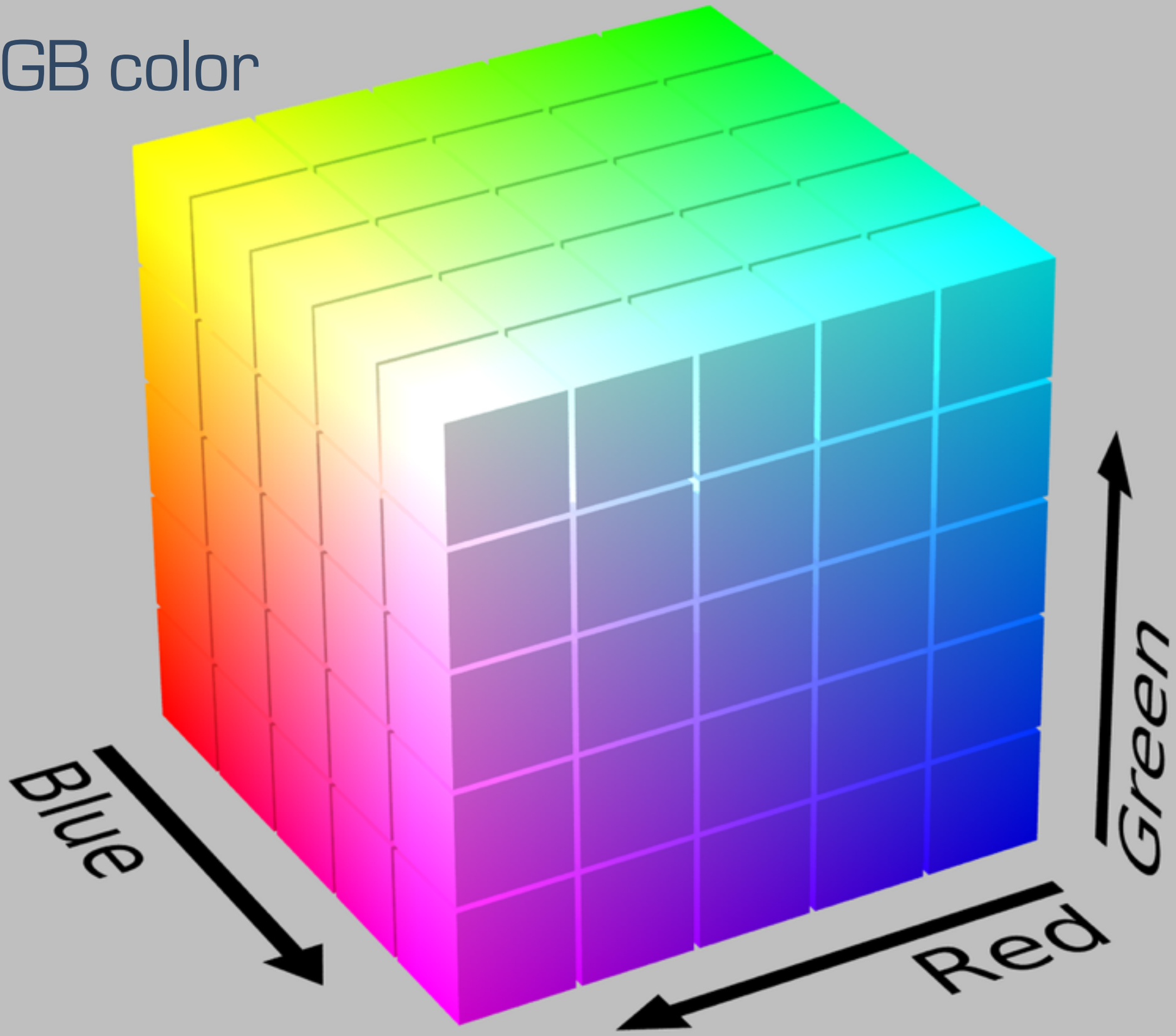
1 bit

24 bit color



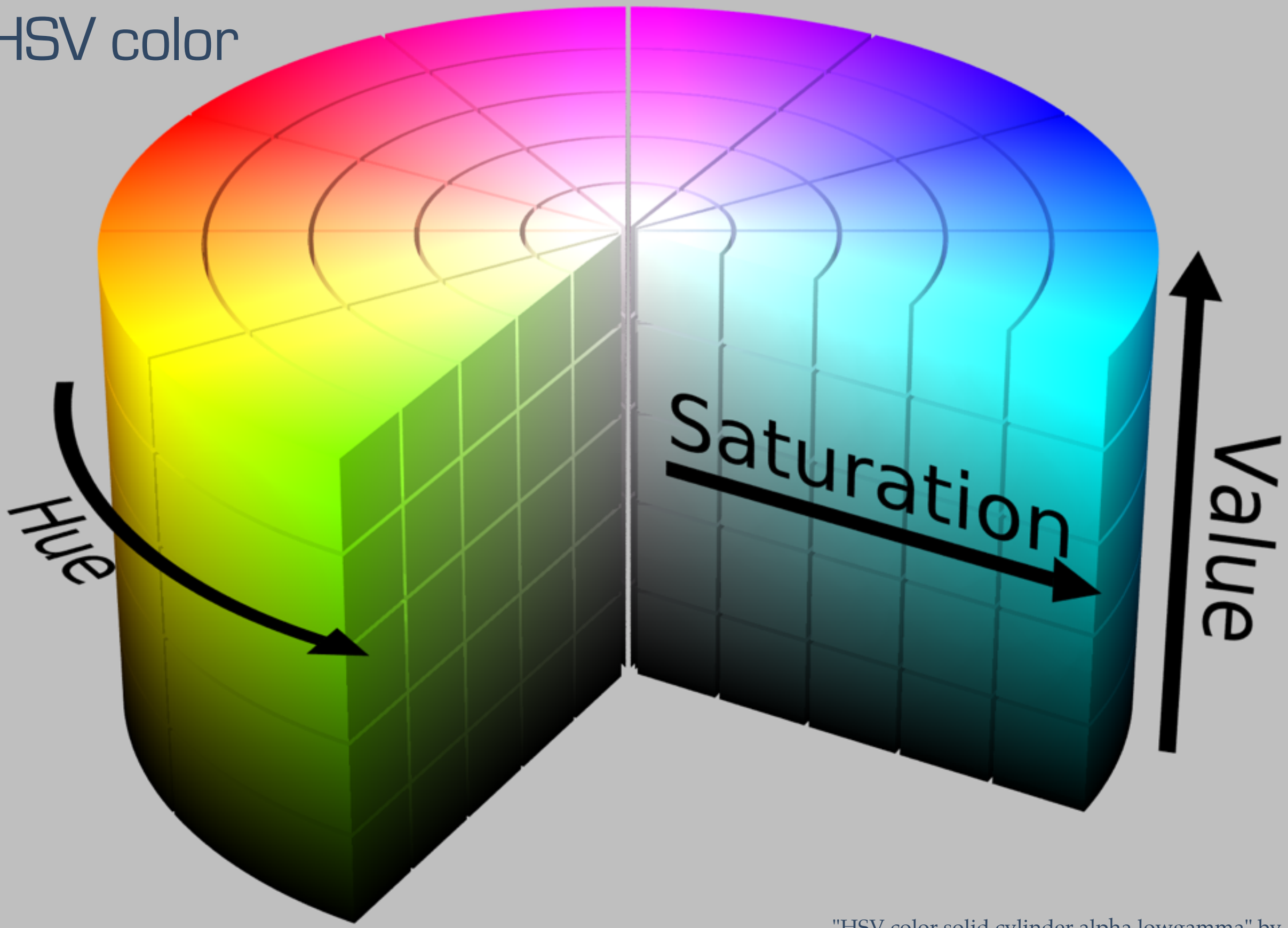
http://www.brucelindbloom.com

RGB color



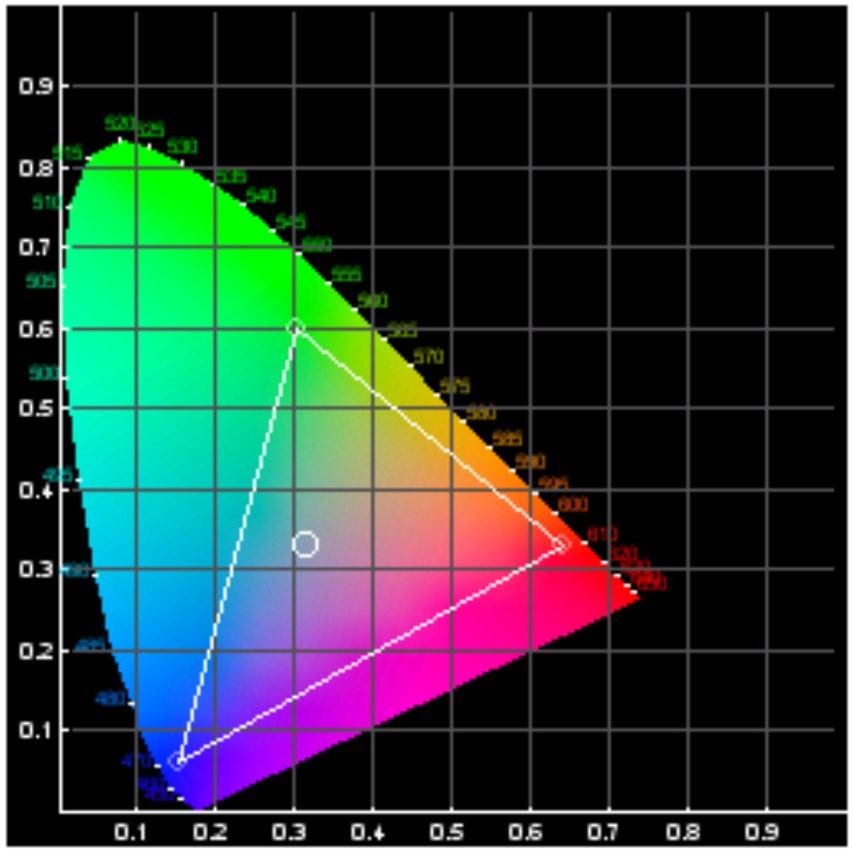
"RGB Cube Show lowgamma cutout a" by Frank Horst

HSV color

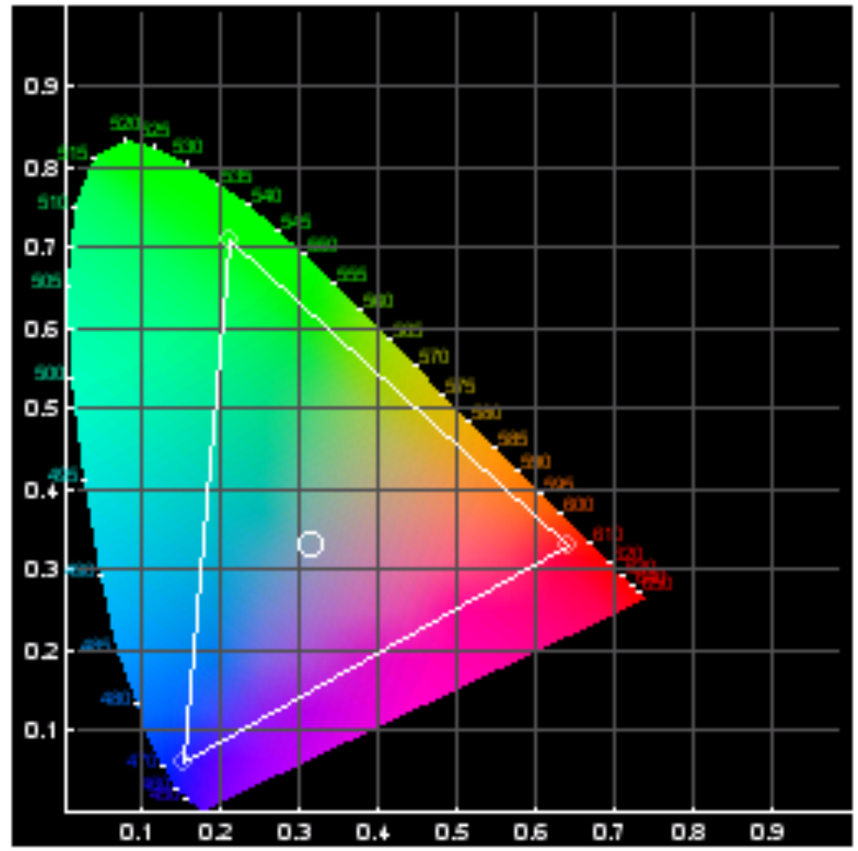


"HSV color solid cylinder alpha lowgamma" by HSV_color_solid_cylinder.png: SharkD

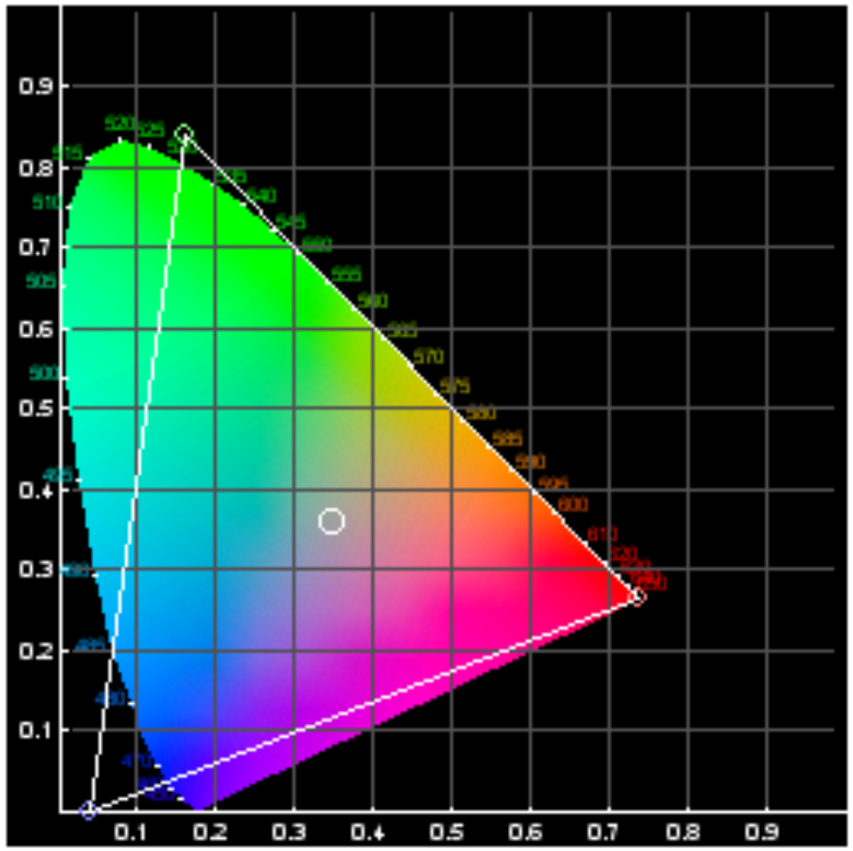
Color gamut



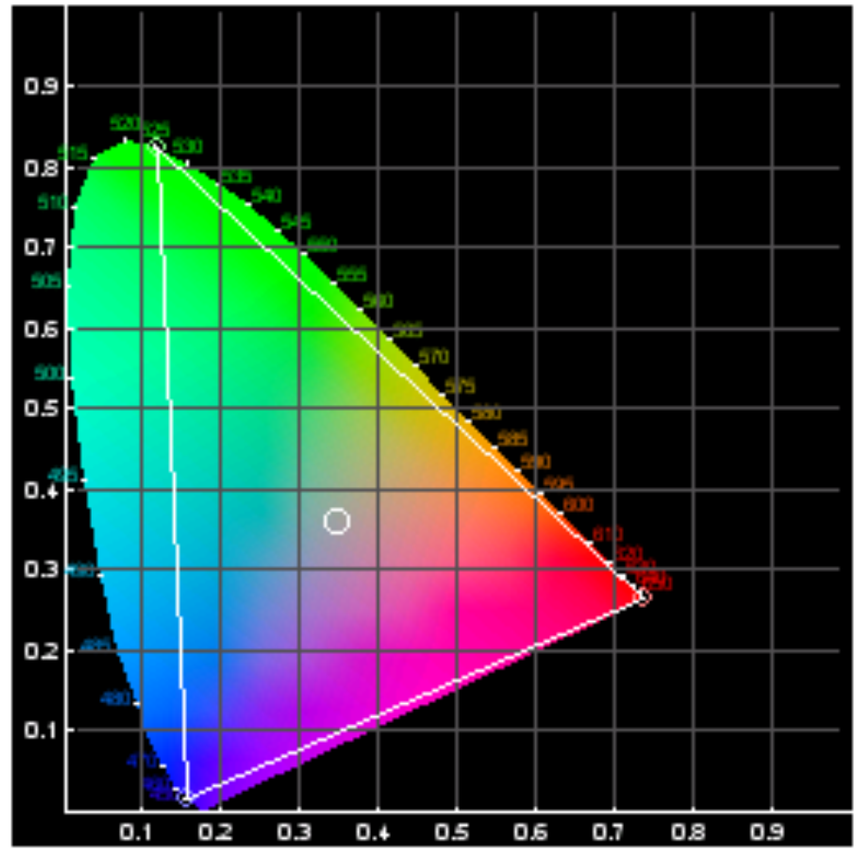
sRGB



AdobeRGB



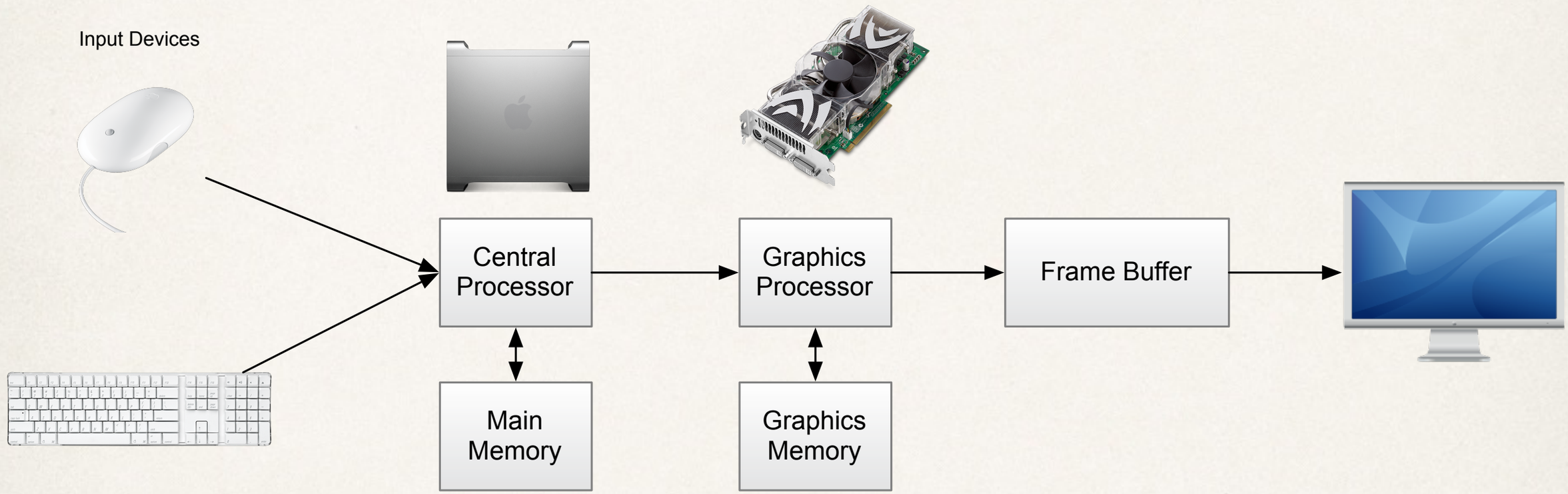
ProPhotoRGB



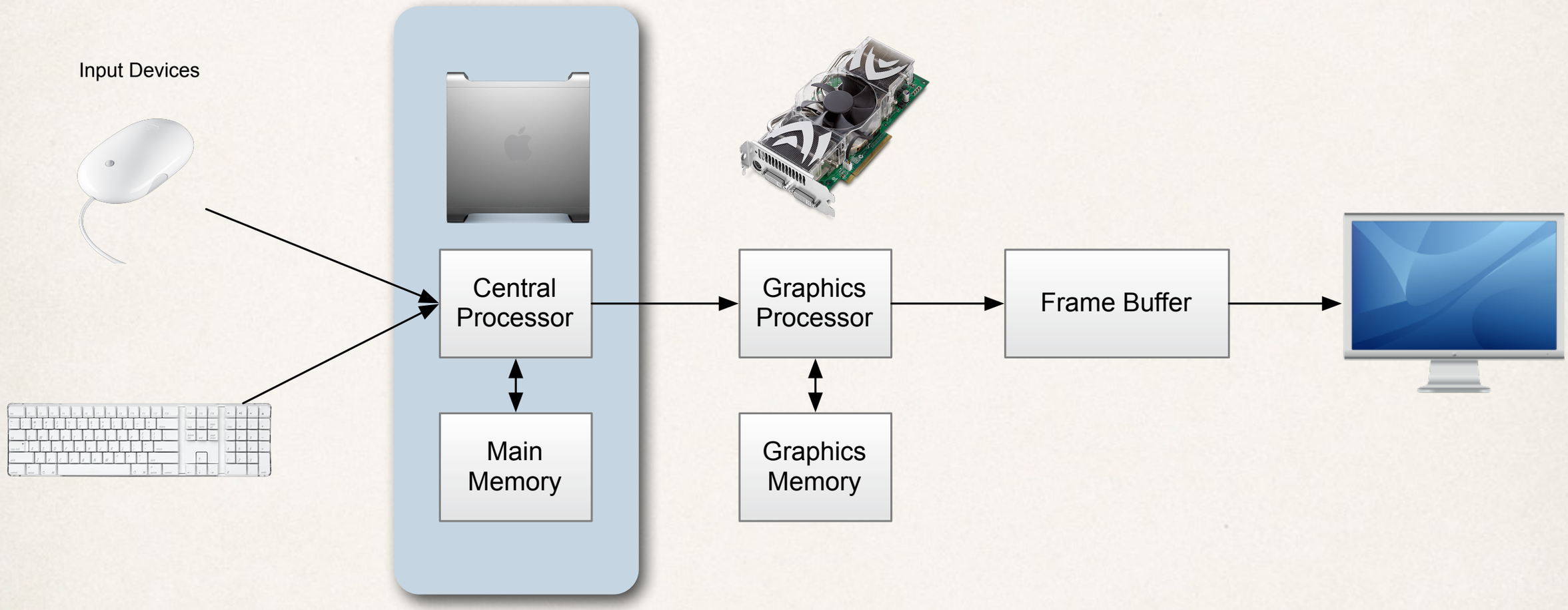
Wide Gamut RGB

Vector vs raster

The graphics system

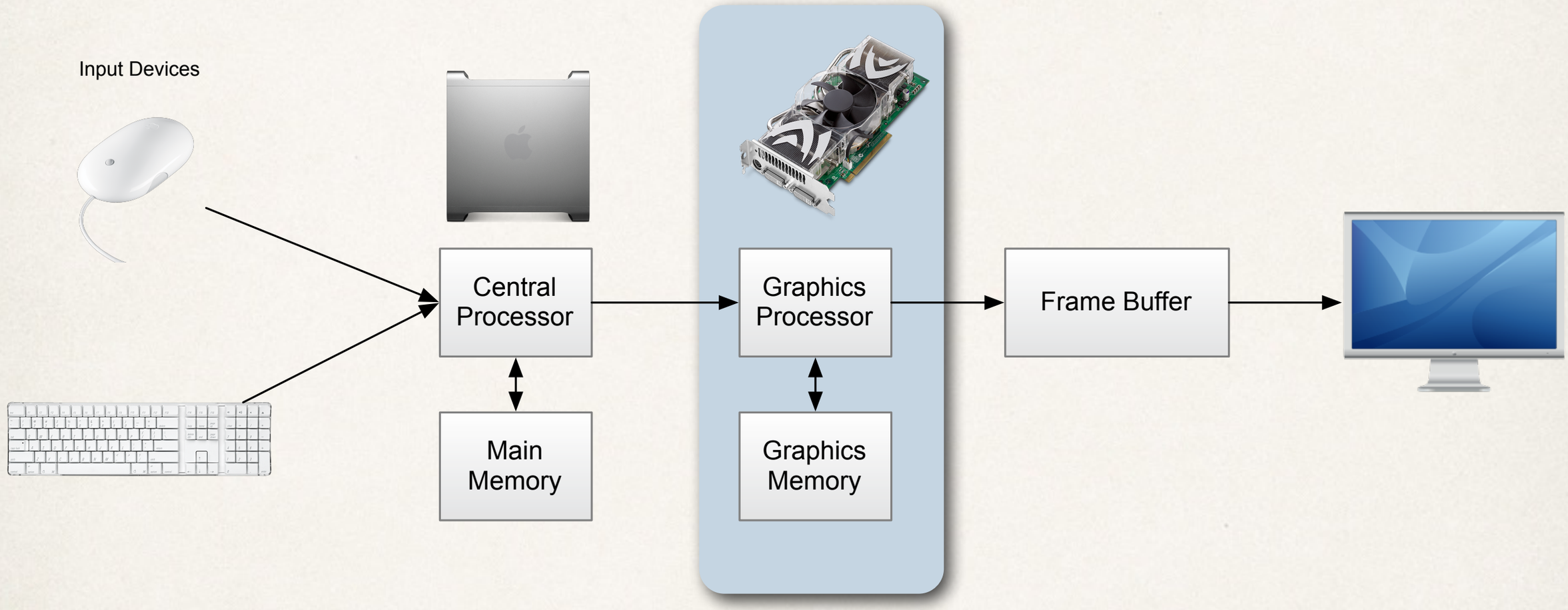


The graphics system



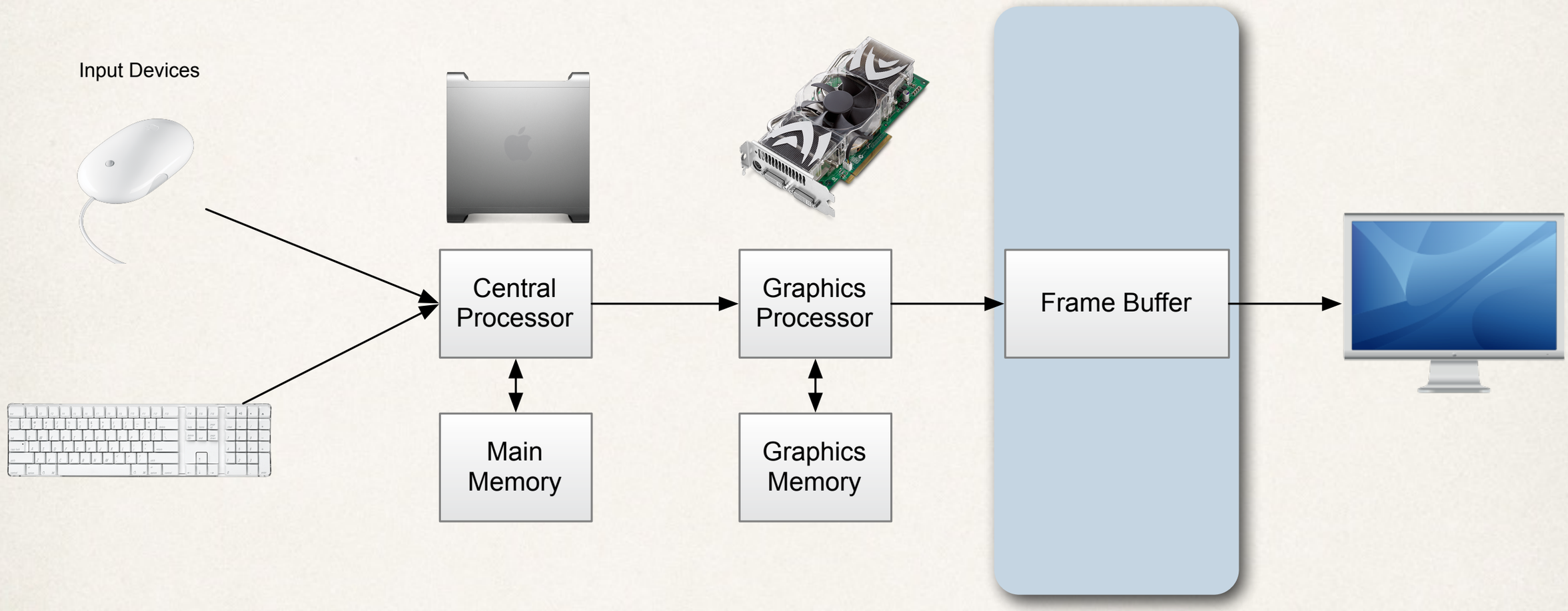
Transfers graphics primitives to the graphics processor

The graphics system



"Rasterizes" the graphics primitives into pixels

The graphics system



Stores the pixels to be displayed on the screen

The display: CRTs

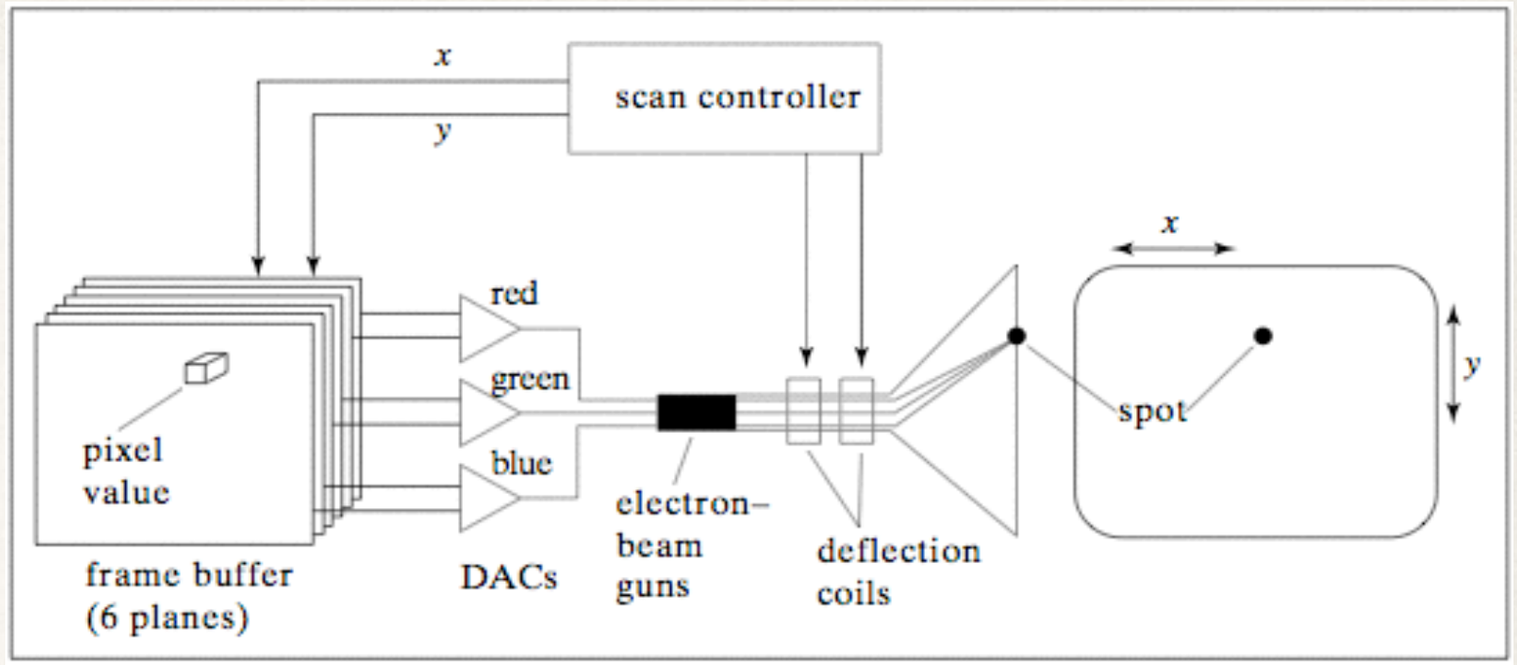
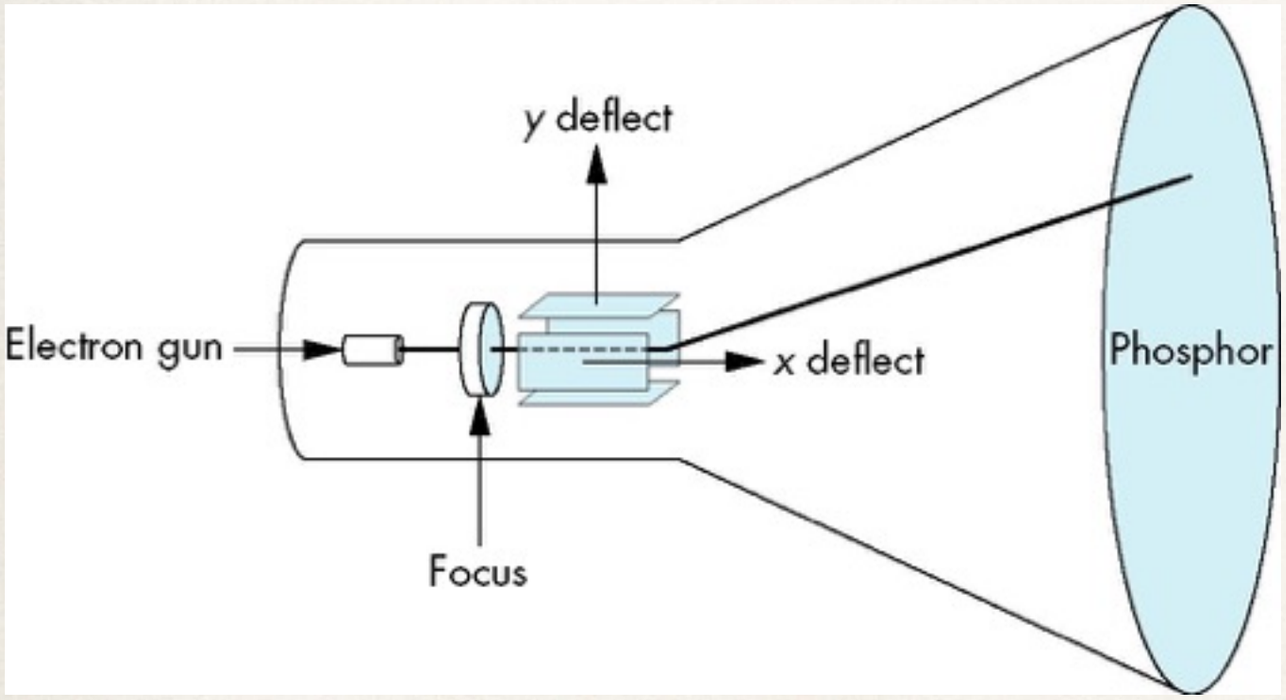
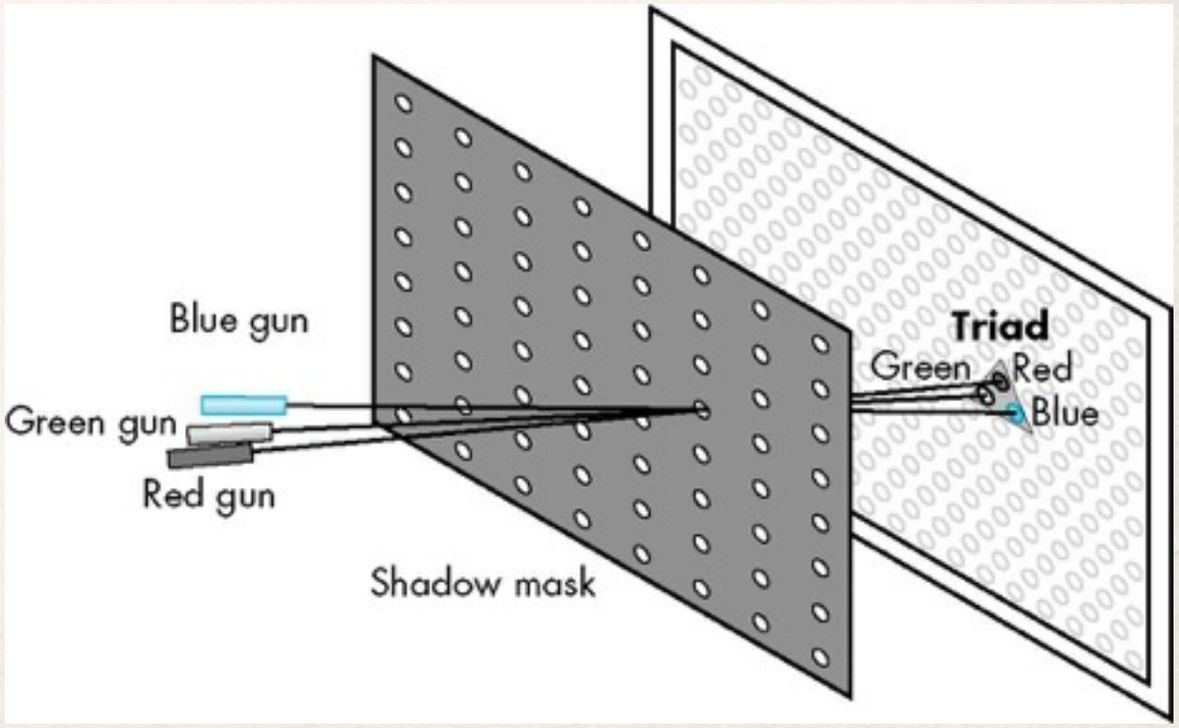


image from F. Hill "Computer Graphics Using OpenGL"





images from E. Angel and D. Shreiner "Interactive Computer Graphics"

The display: Flat panels

LCD / LED displays

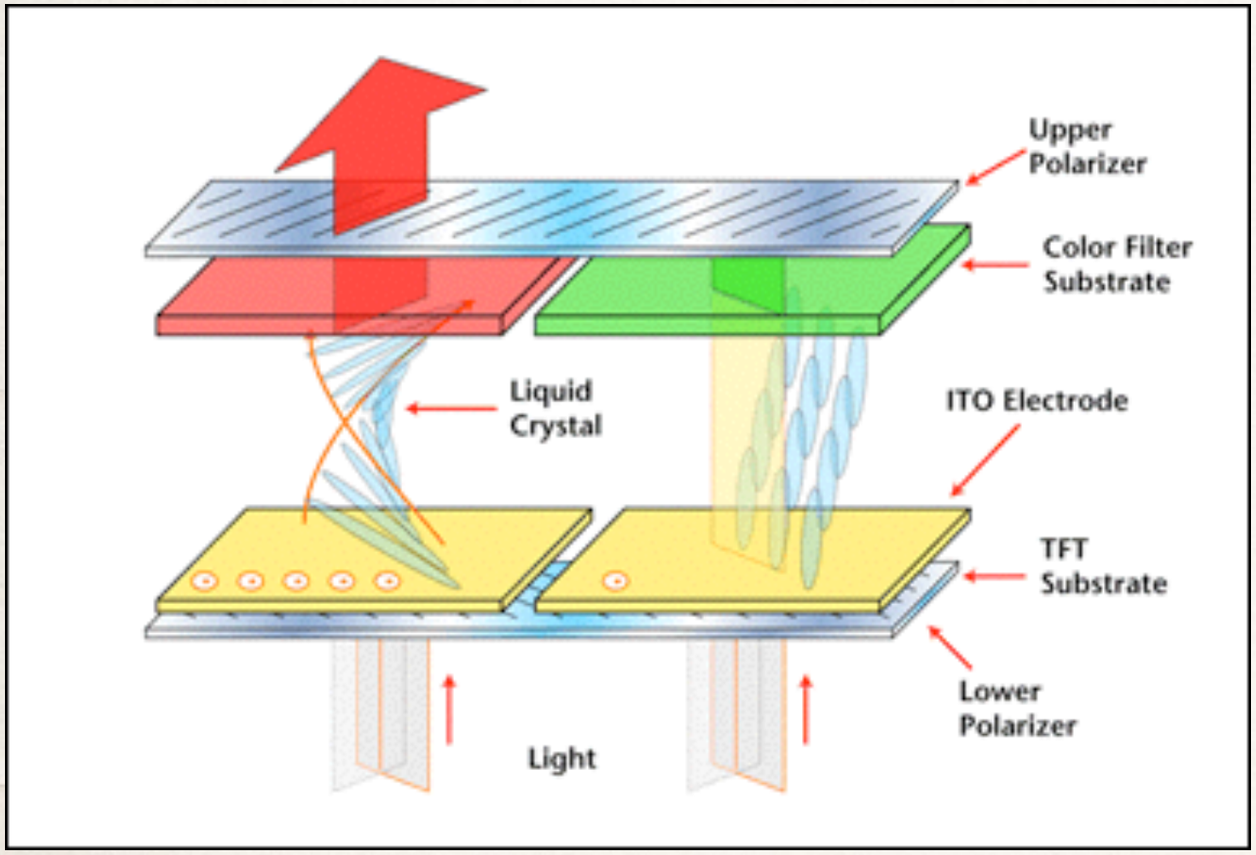


image from http://www.laptop-lcd-screen.co.uk/laptopparts/what-is-lcd-how-laptop-screen-works.asp

Plasma displays

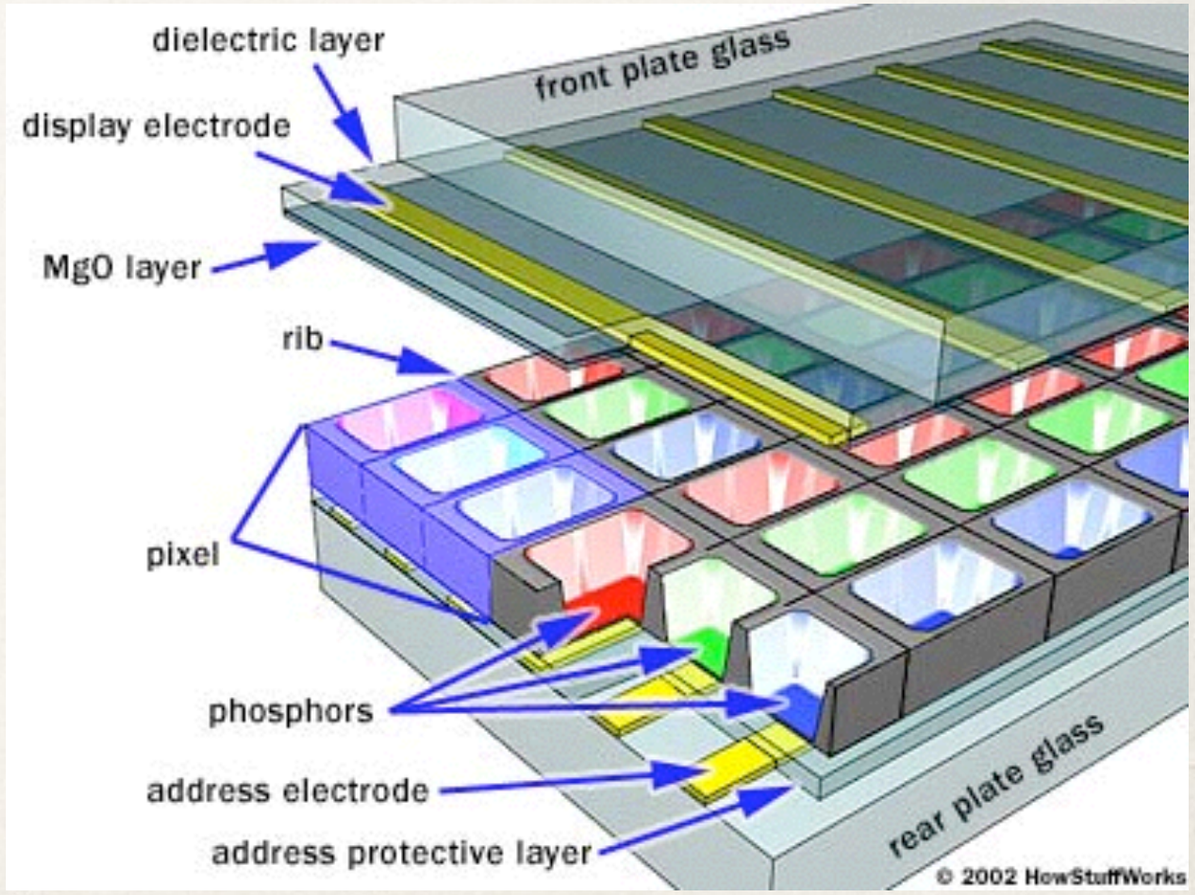


image from http://electronics.howstuffworks.com/plasma-display2.htm