

What is Computer Graphics?



Source: <http://wall.alphacoders.com>

What is Computer Graphics (CG)?

- Science and art of visual communication via the computer

- CG is highly cross disciplinary:

CG = Physics + Mathematics + Human perception + HCI + Engineering + Art

Graphics Areas

Modeling

**Mathematical
specification of
shape & appearance**

Animation

**Creation of illusion
of motion through
sequence of images**

Rendering

**Creation of shaded
images from models**

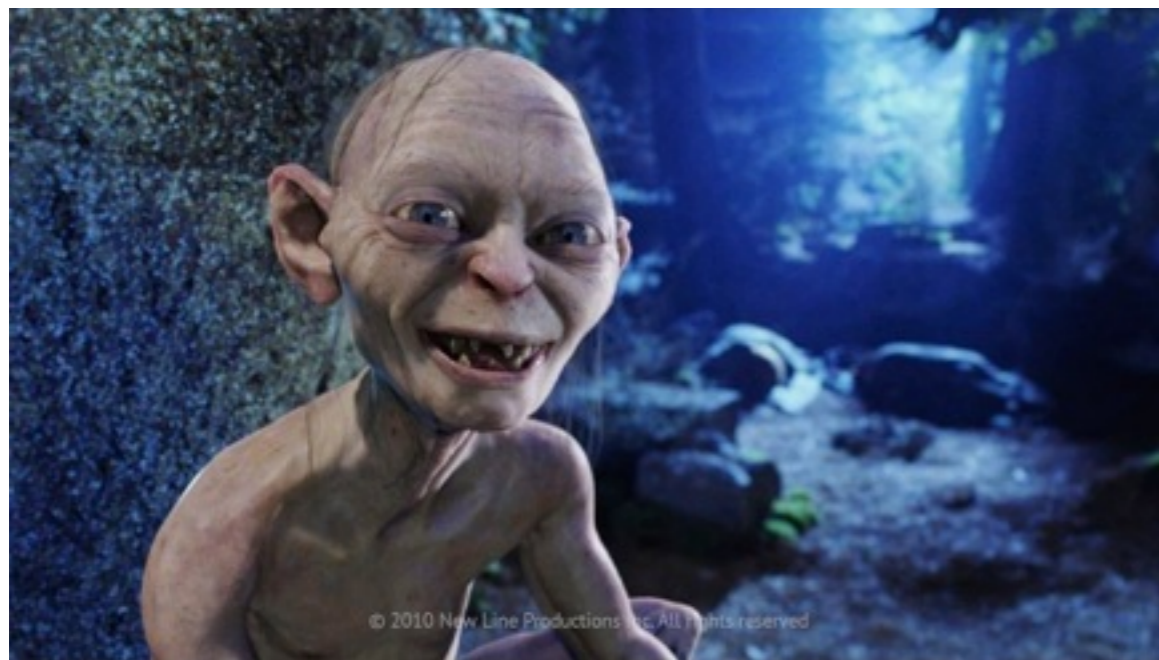
CG in Entertainment

Video games



CG in Entertainment

Film special effects (VFX)



VFX Video

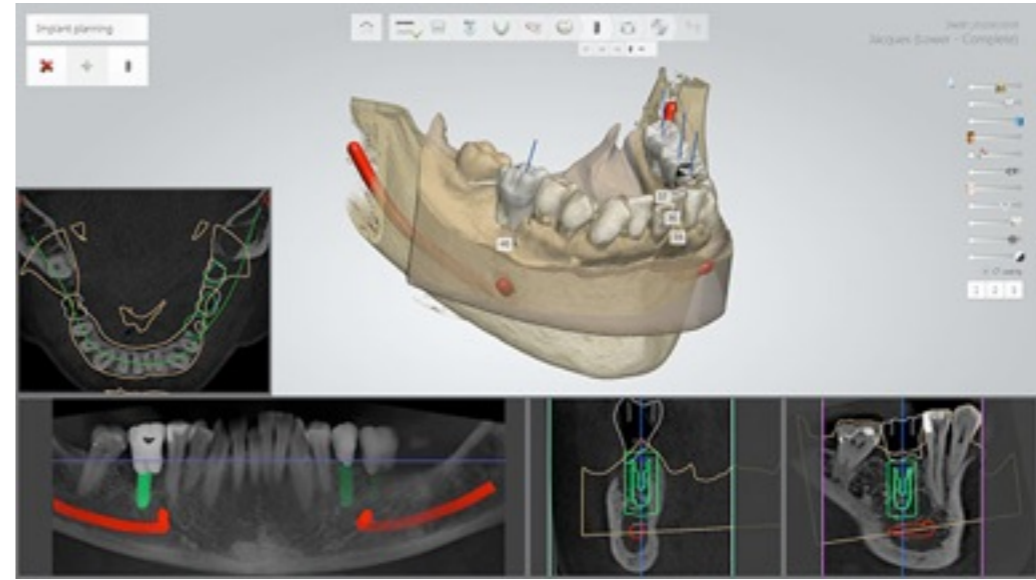


Virtual Backlot

CG in CAD/CAM



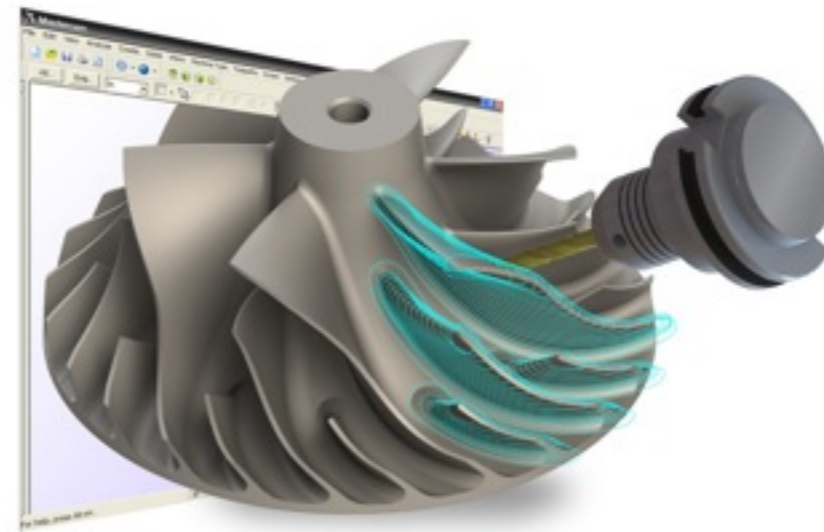
Source: <http://autocad-architecture-blog.com/how-to/how-to-start-project/>



Source: <http://www.3shapedental.com/pressreleases/3shape-launches-implant-studio/>



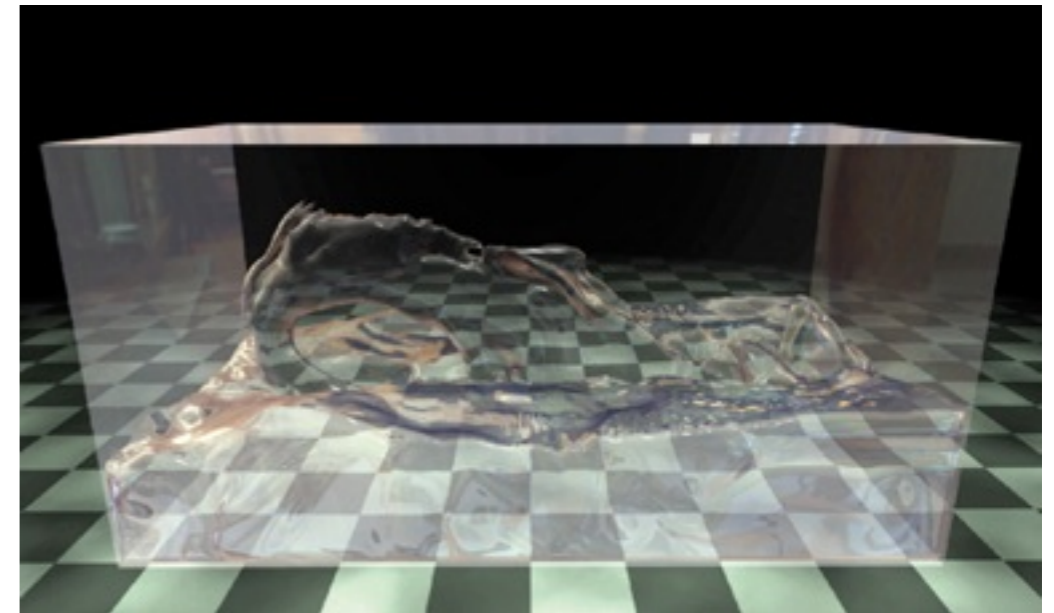
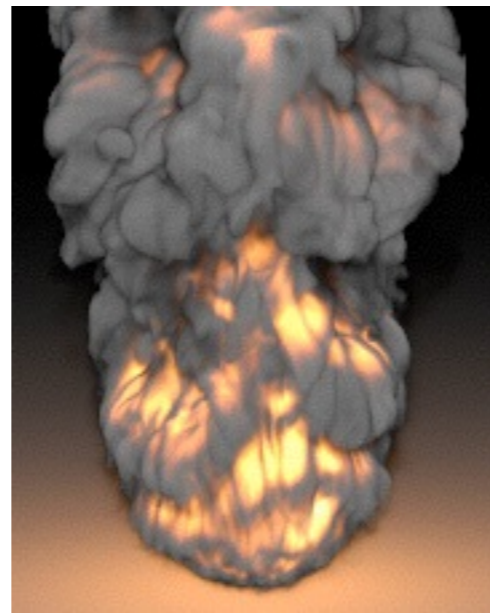
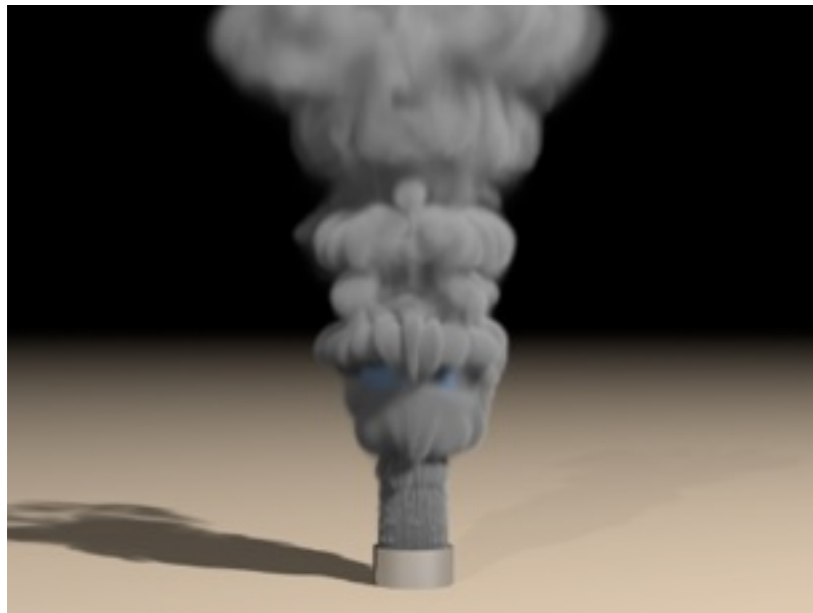
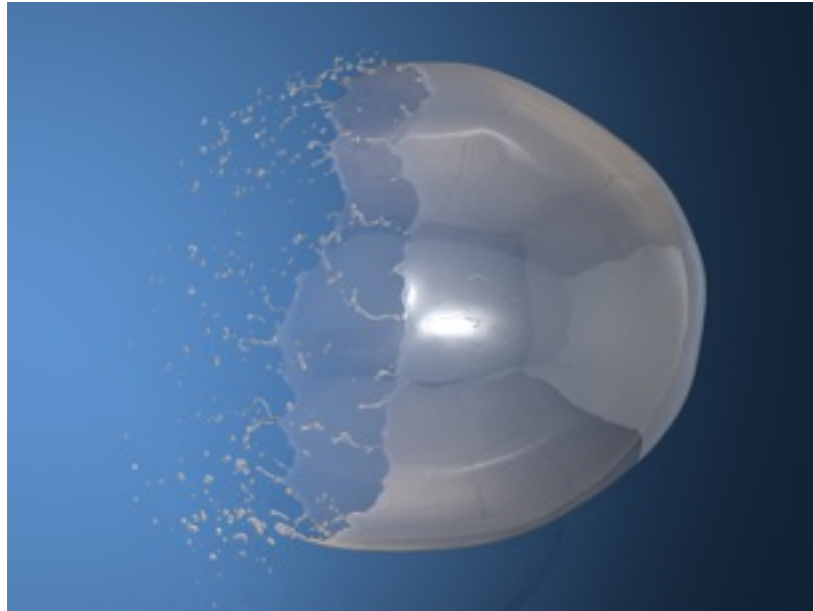
Source: <http://renderingofarchitecture.com/3d-visualisation-urban-planning-almeria>



Source: <http://medspark.ms/Technical-Glossary-All.php>

CAD/CAM: Computer Aided Design/ Computer Aided Manufacturing

CG in Simulation



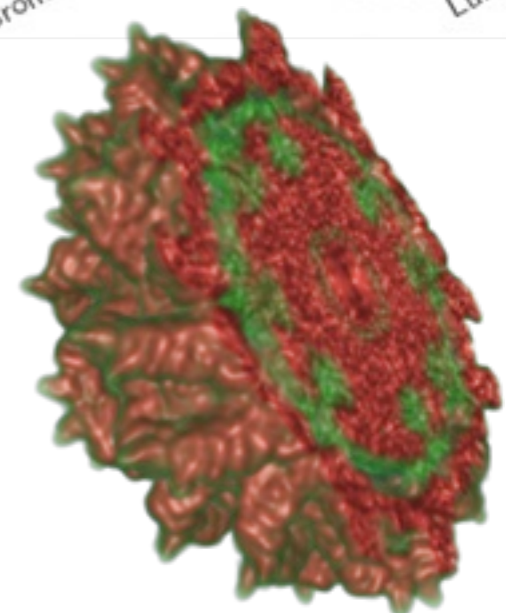
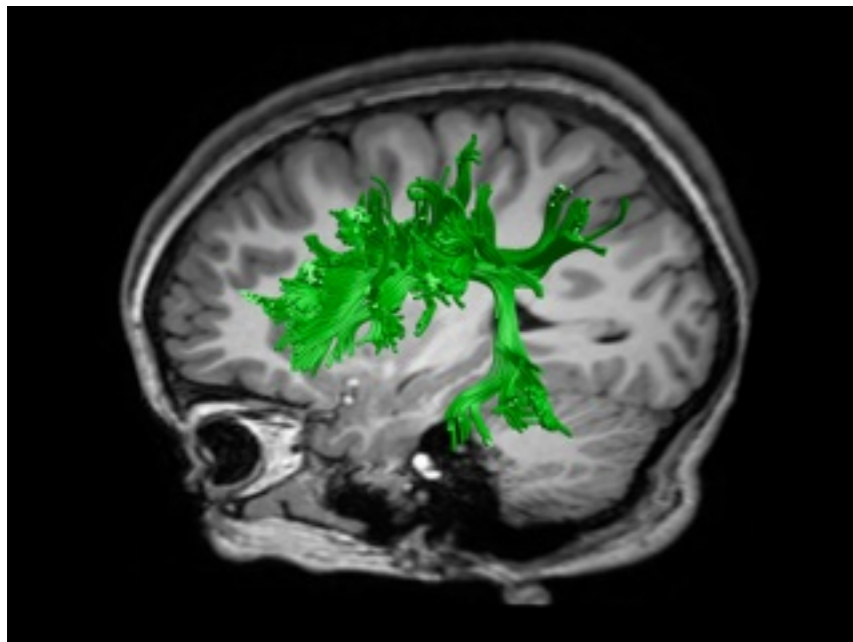
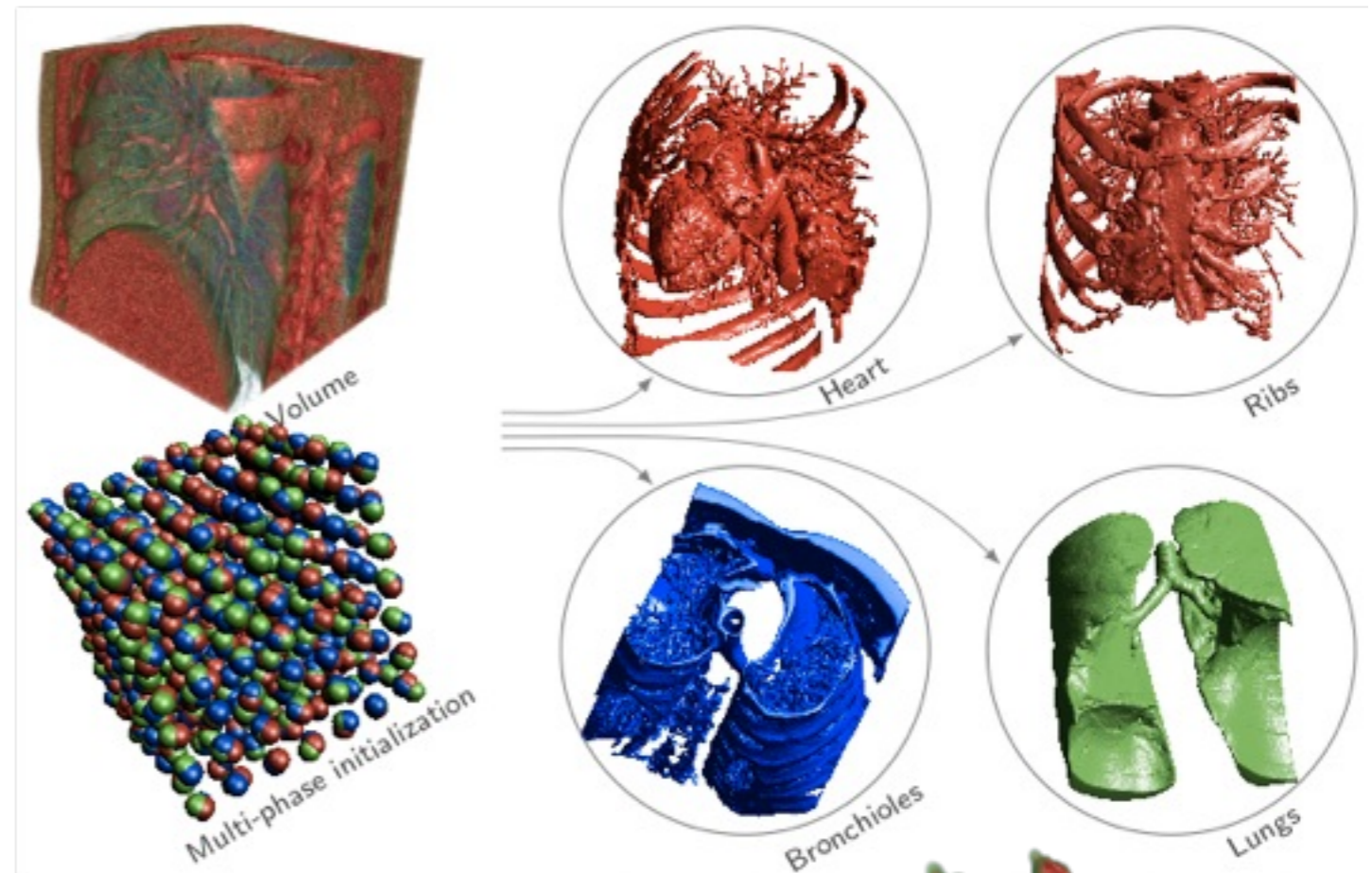
Source: <http://physbam.stanford.edu/~fedkiw/>

Source: http://http.developer.nvidia.com/GPUGems3/gpugems3_ch30.html

CG in Medical Imaging



Source: http://www.nvidia.com/object/io_1259560188980.html



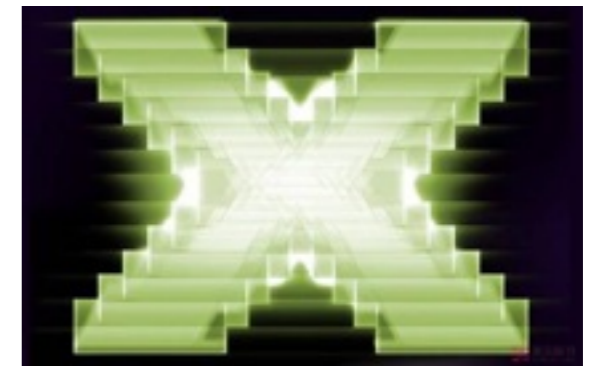
What is required in Graphics?

- **Core concepts from Mathematics** (calculus, geometry, algebra, differential equations, numerical methods)
- **Core concepts from Physics** (basic laws, optics, electromagnetism)
- **Core concepts from Computer Science** (Data structures, algorithms) and *lots of programming!*

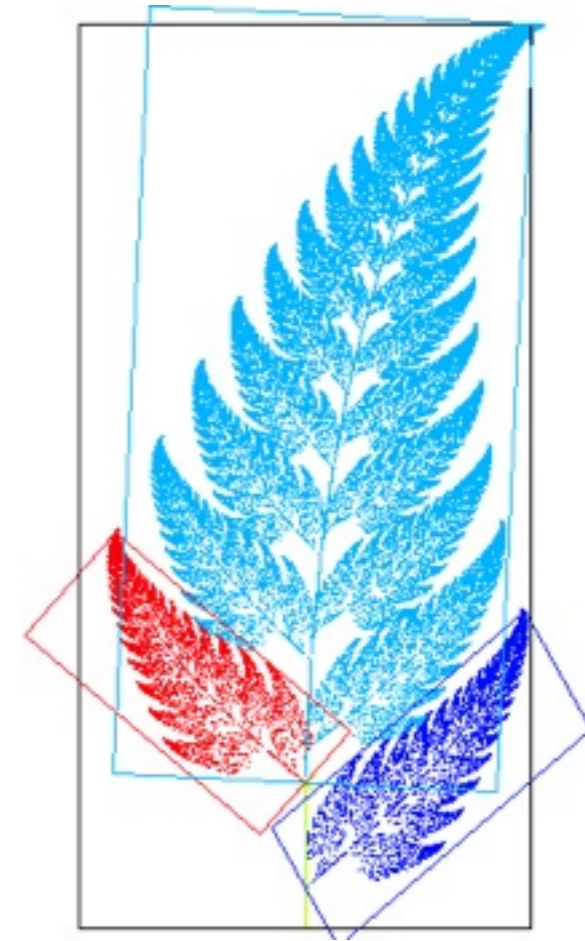
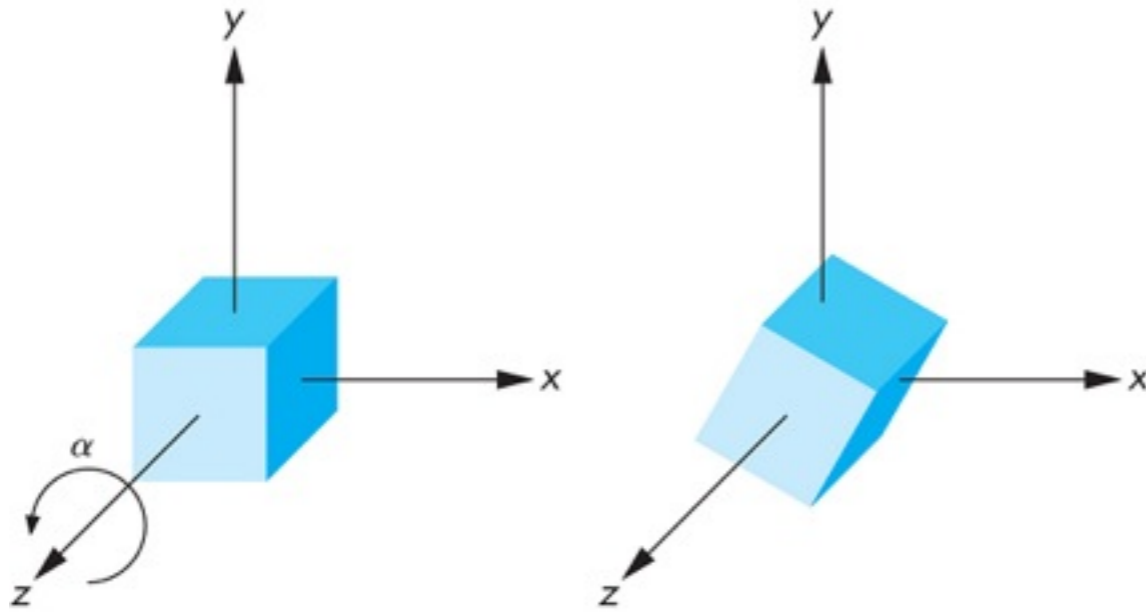
What to learn in Graphics?

Graphics APIs

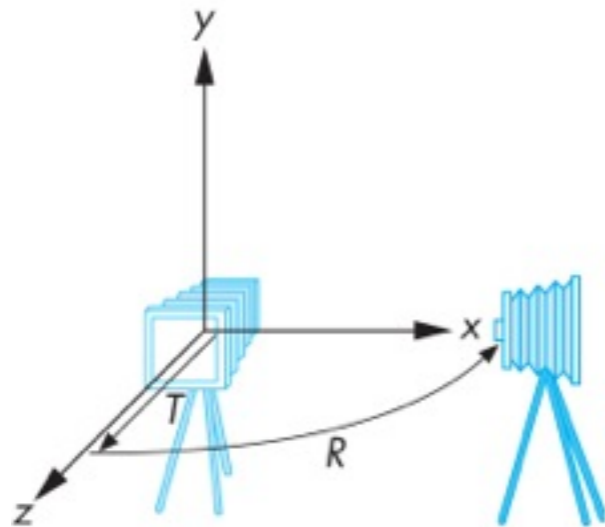
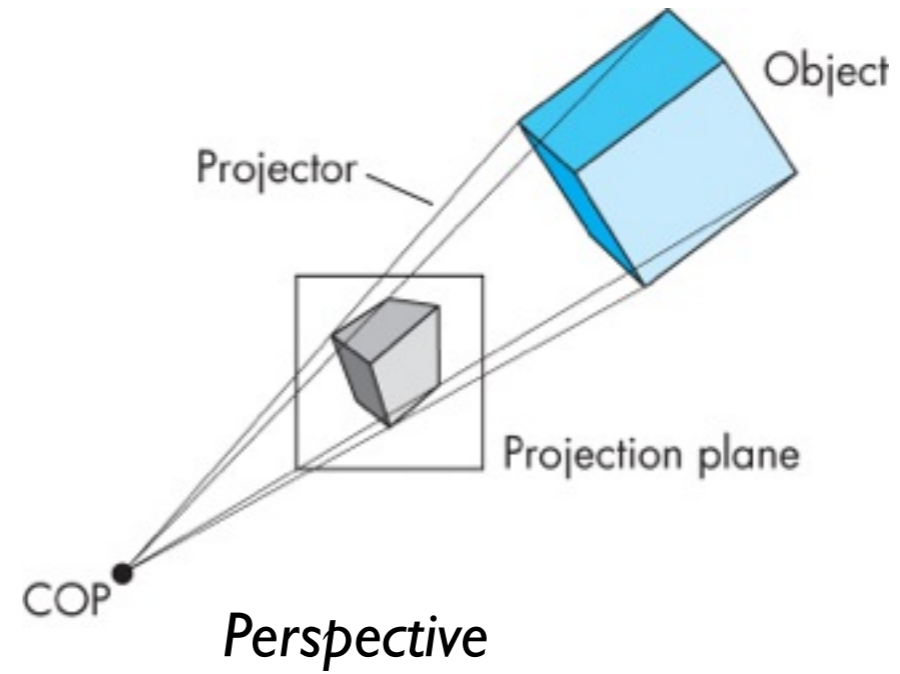
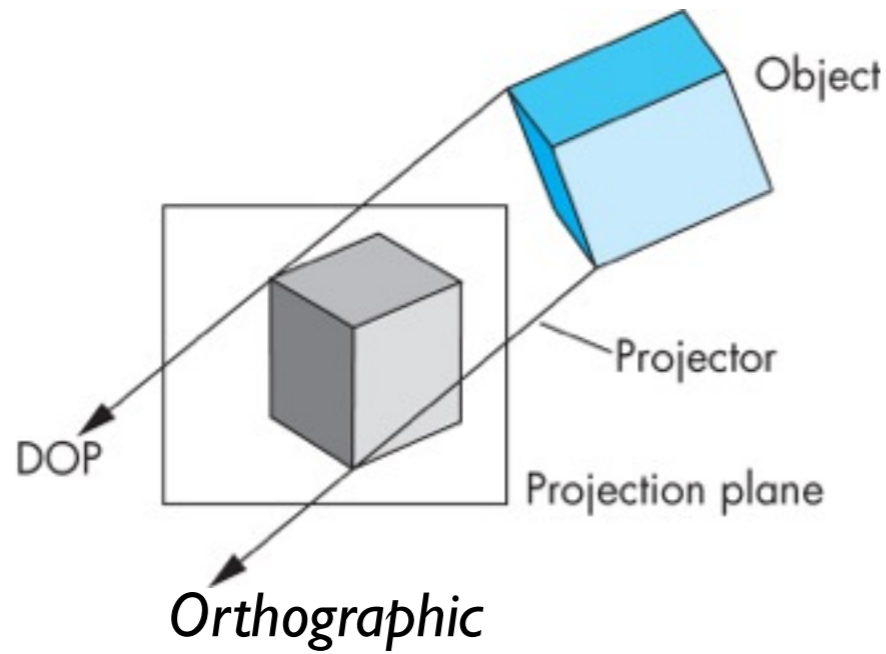
- OpenGL
- DirectX



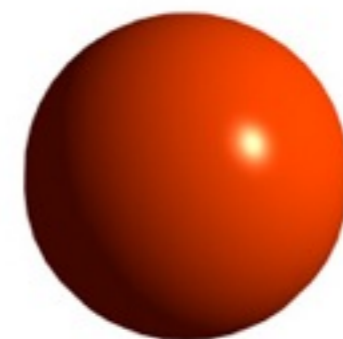
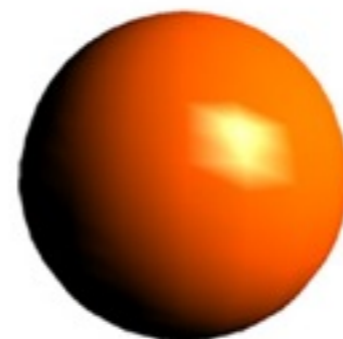
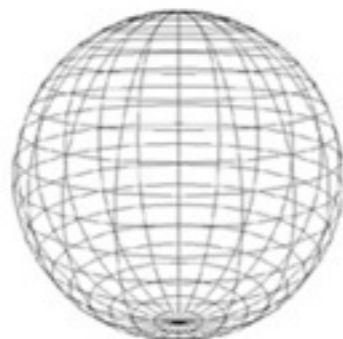
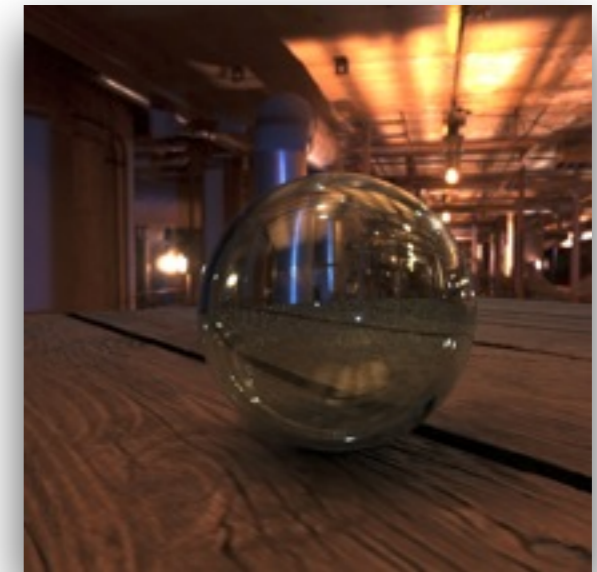
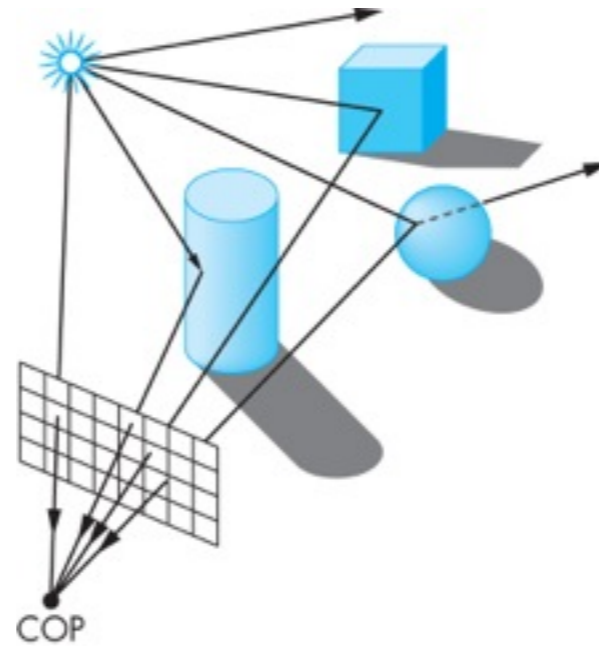
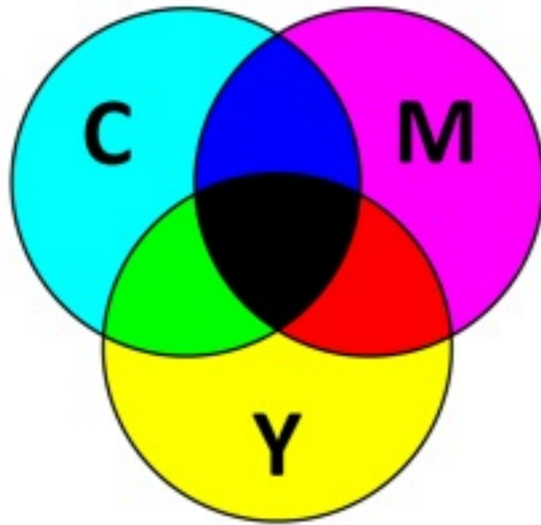
2D/3D Transformations



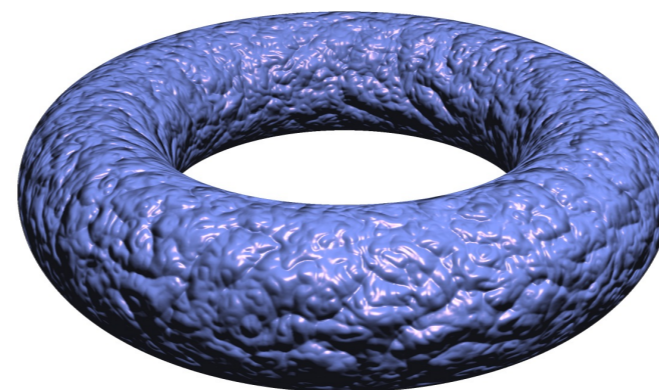
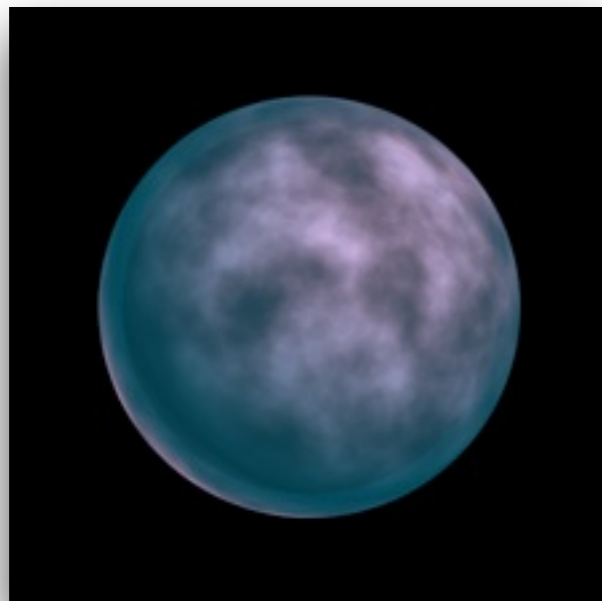
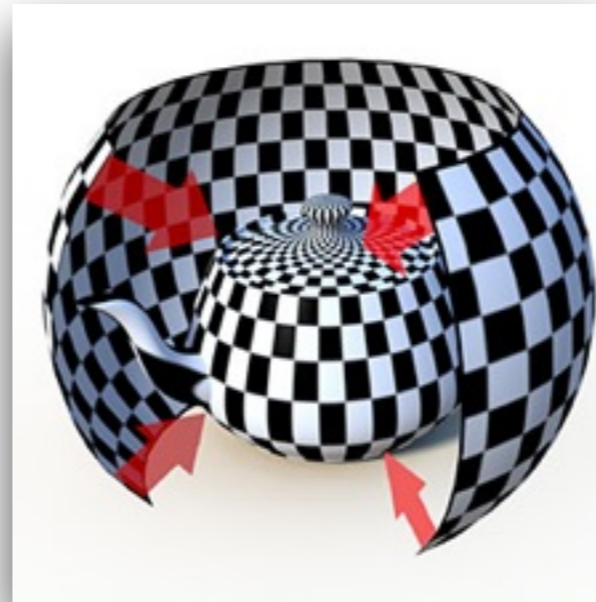
Viewing



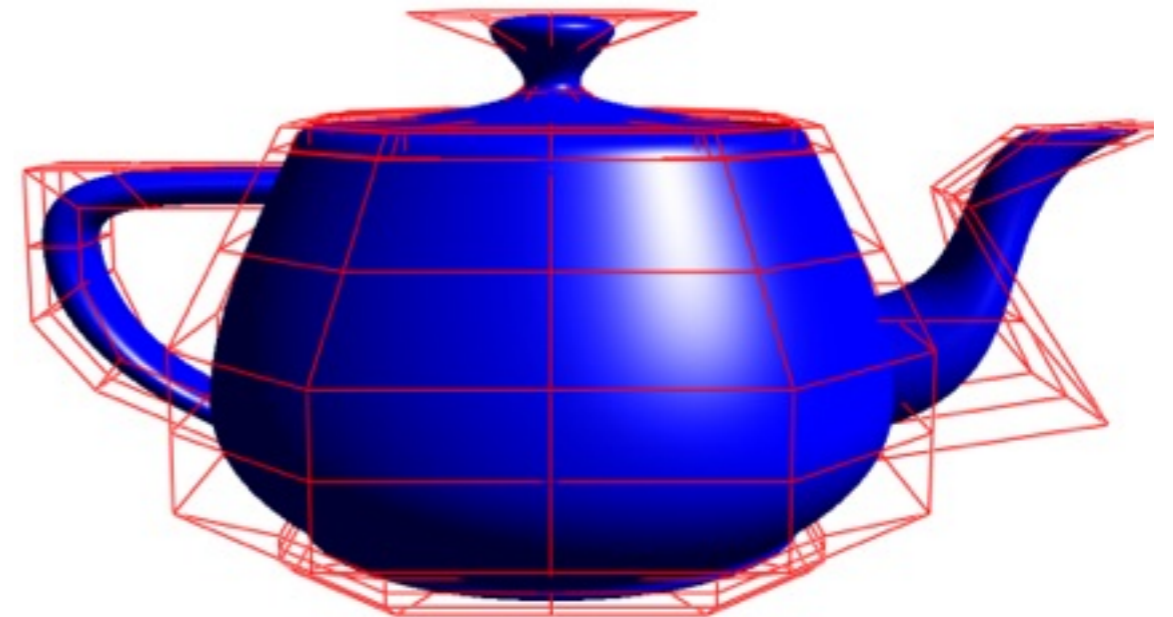
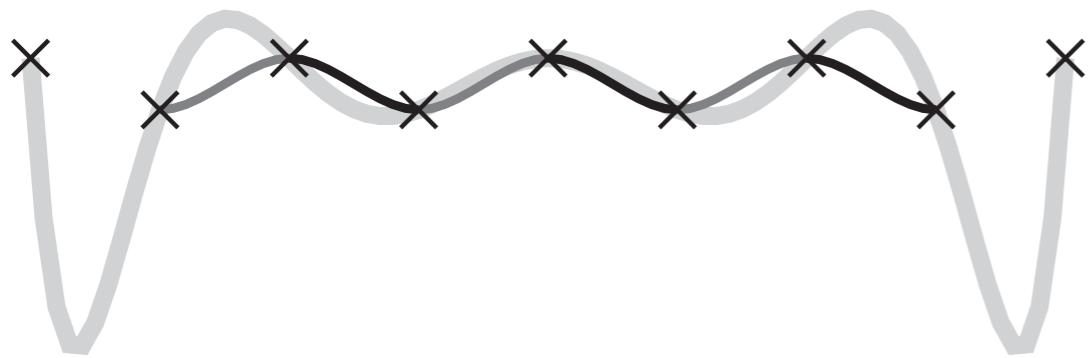
Lighting and Shading



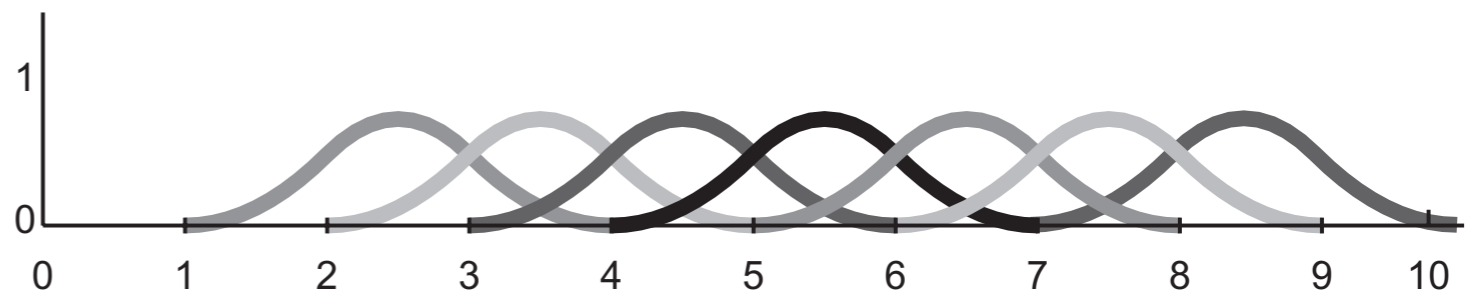
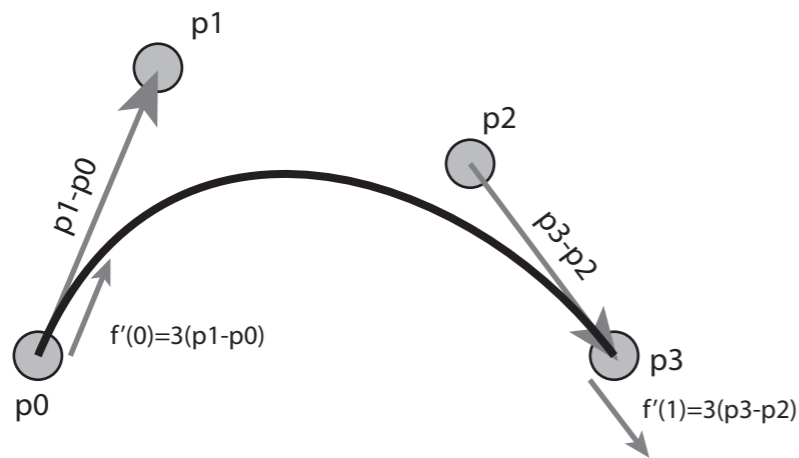
Texturing



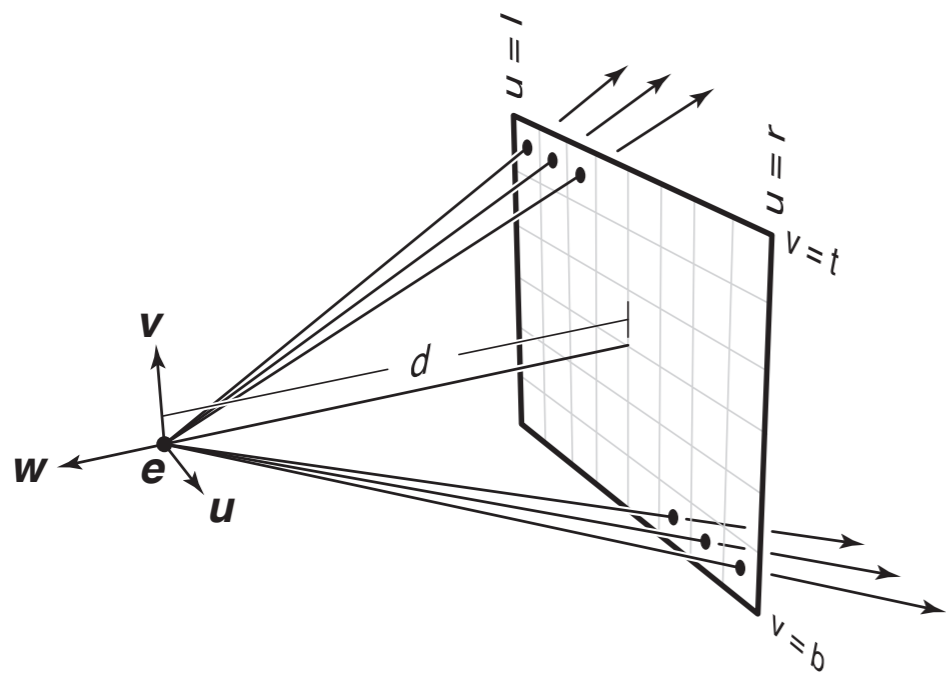
Curves and Surfaces



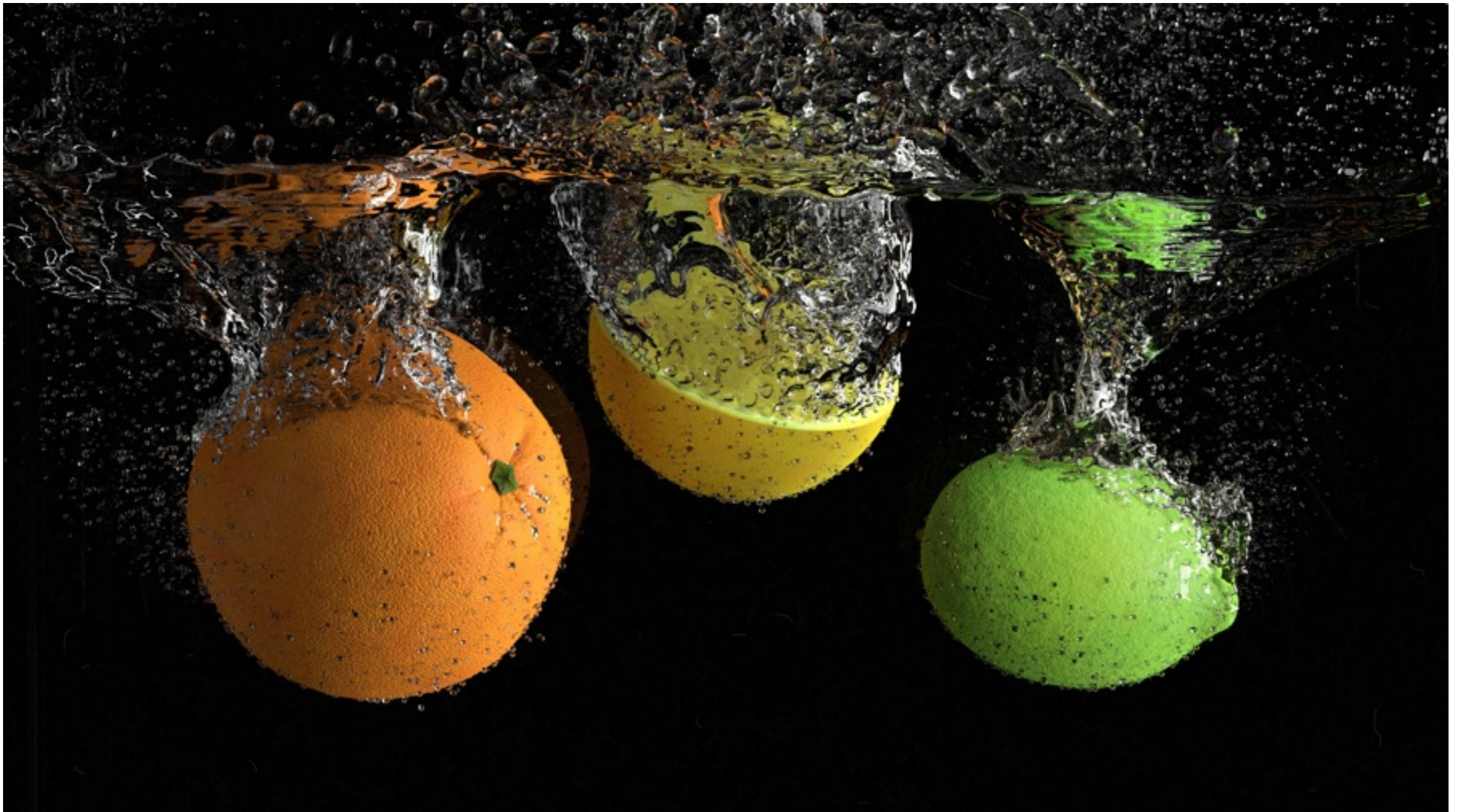
Source: James P. O'shea, U C Berkeley



Ray Tracing



Photorealistic Rendering



<http://www.blender.org/wp-content/uploads/2012/11/rendering.jpg>

and much more...

