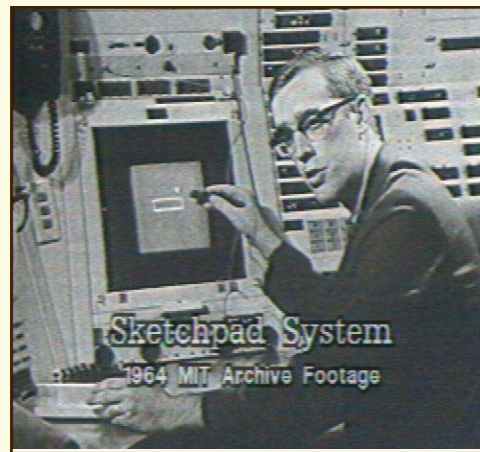# History of computer graphics

CS 248 - Introduction to Computer Graphics

Autumn quarter, 2004

Slides for September 28 lecture

Marc Levoy

Ivan Sutherland (1963) - SKETCHPAD

pop-up menus

constraint-based drawing

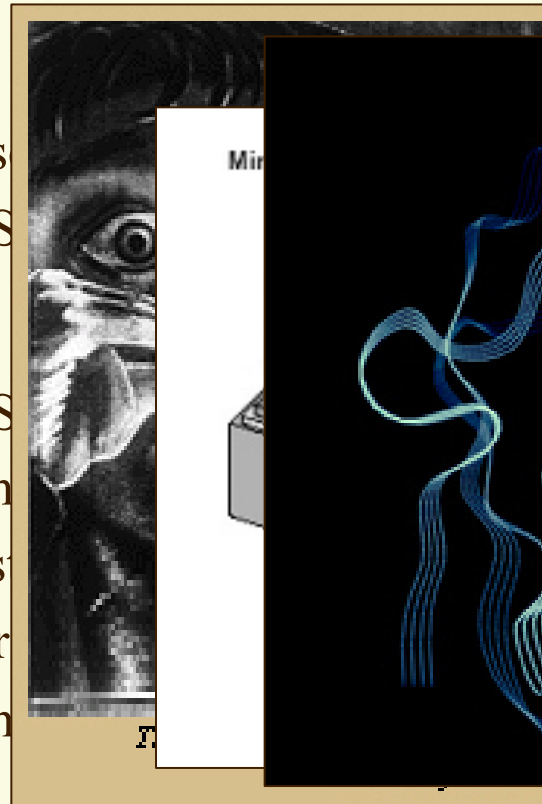hierarchical modeling

Display hardware

vector displays

– 1963 – modified os

– 1974 – Evans and S

raster displays

– 1975 – Evans and S

– 1980s – cheap fram

– 1990s – liquid-crys

– 2000s – micro-mirr

– 2010s – high dynan

other

– stereo, head-mounted displays

– autostereoscopic displays

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Input hardware

2D

– light pen, tablet, mouse, joystick, track ball, touch panel, etc.

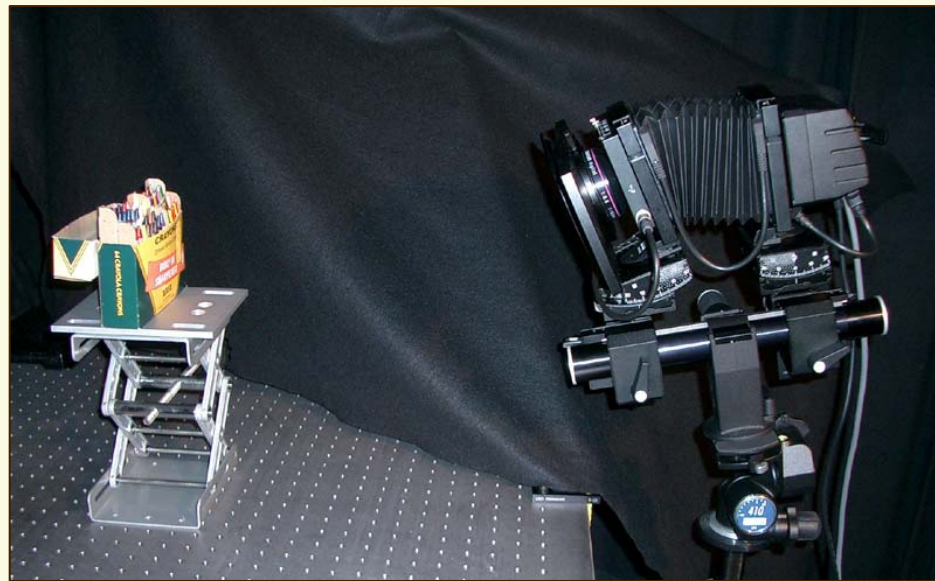– 1970s & 80s - CCD analog image sensor + frame grabber
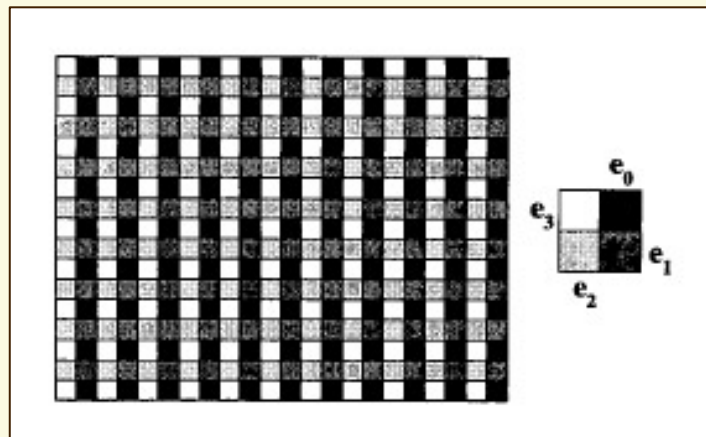
Input hardware

2D

Input hardware

2D

– light pen, tablet, mouse, joystick, track ball, touch panel, etc.

– 1970s & 80s - CCD analog image sensor + frame grabber

– 1990s & 2000's - CMOS digital sensor + in-camera processing

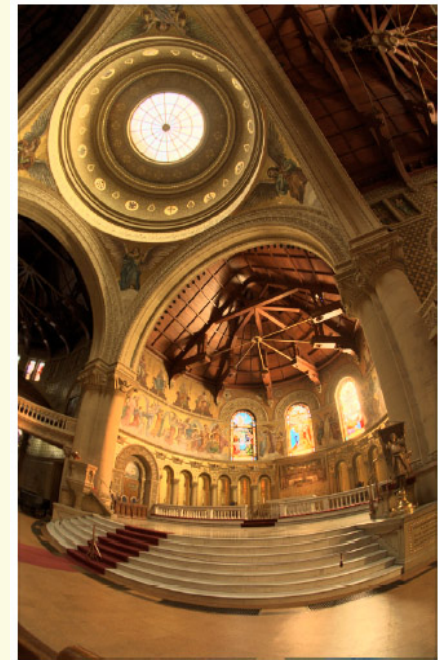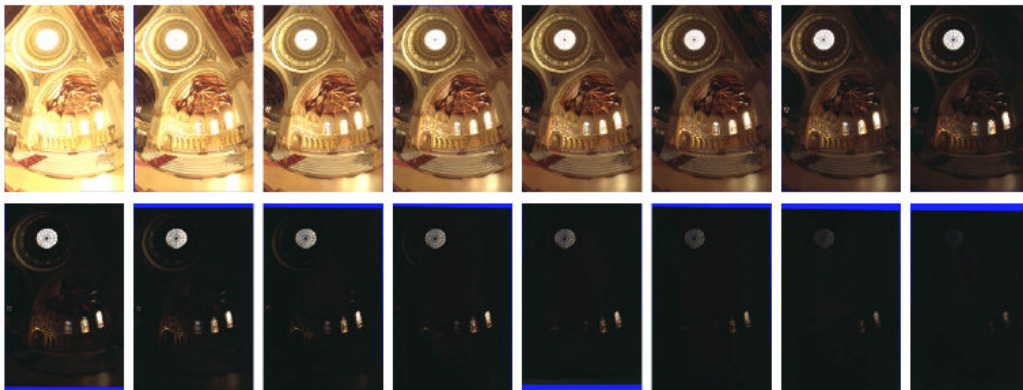$\rightarrow$ high-dynamic range (HDR) imaging

[Nayar00]

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negative film = 130:1 (7 stops)

paper prints   = 46:1

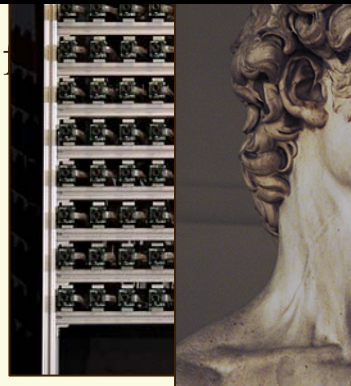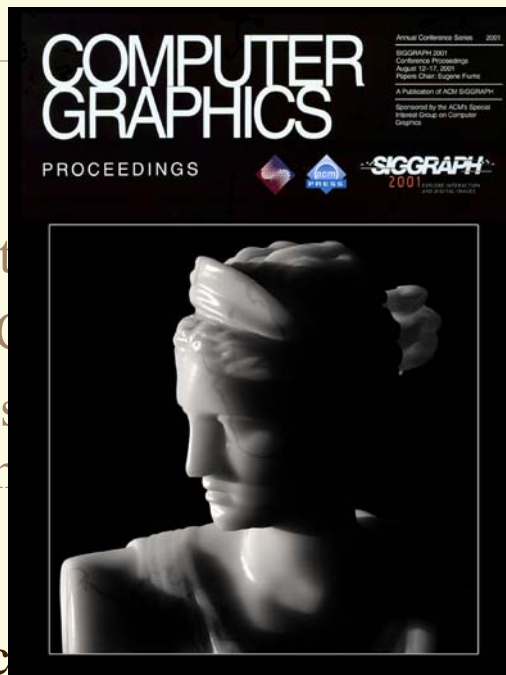[Debevec97] = 250,000:1 (18 stops)

Input hardware

2D

– light pen, tablet

– 1970s & 80s - C

– 1990s & 2000's
    high-dynam

3D

– 1980s - 3D trac

– 1990s - active range
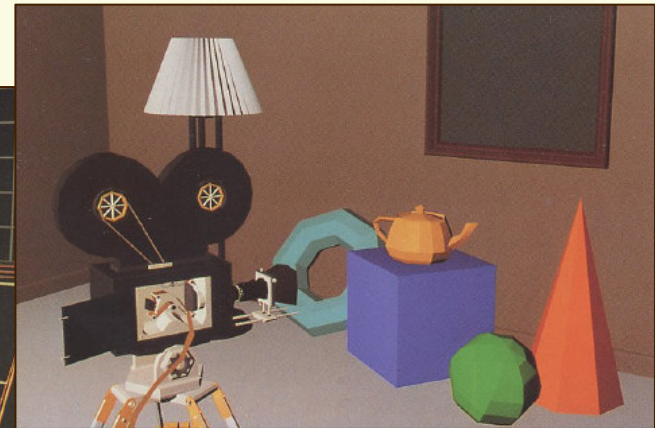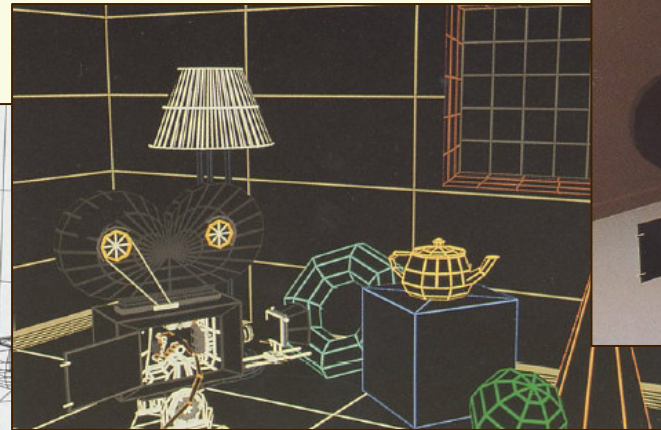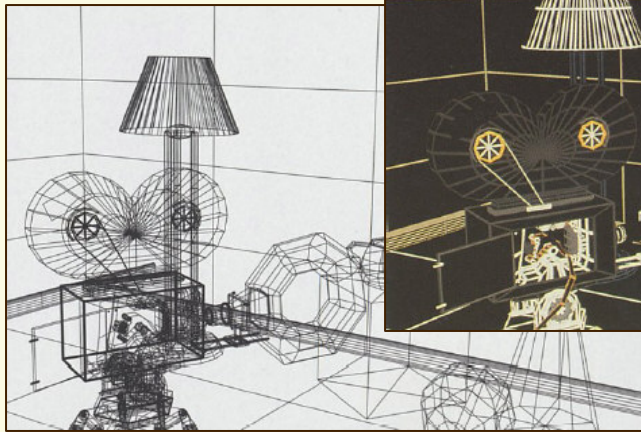
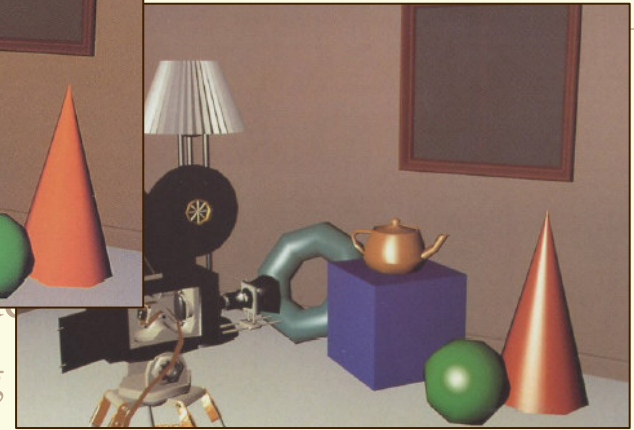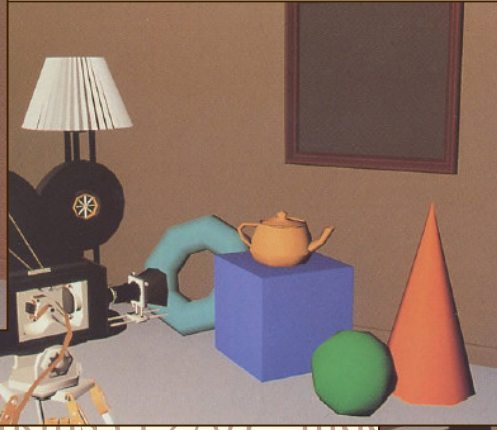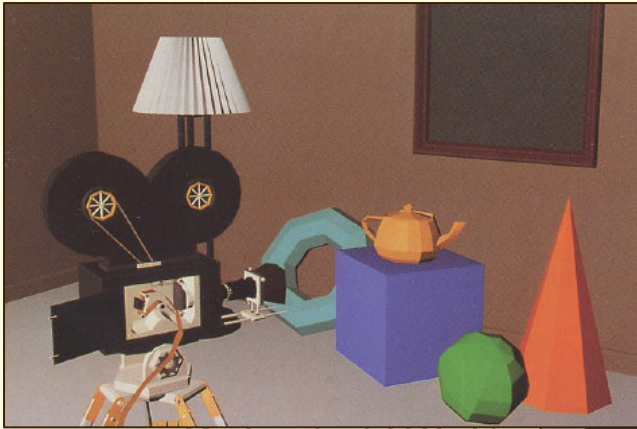## 4D and higher

– multiple cameras

– multi-arm gantries

Rendering

1960s - the visibility problem

- Roberts (1963), Appel (1967) - hidden-line algorithms
- Warnock (1969), Watkins (1970) - hidden-surface algorithms
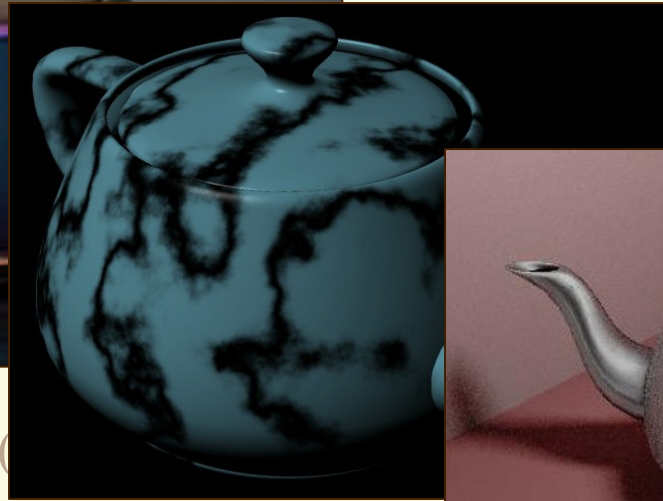- Sutherland (1974) - visibility = sorting

– Roberts (1963), ~~~~~~~~~~
– Warnock (1969), ~~Watkins (1970)~~ ~~hidden~~
– Sutherland (1974) - visibility = sorting

1970s - raster graphics

– Gouraud (1971) - diffuse lighting

– Phong (1974) - specular lighting

– Blinn (1974) - curved surfaces, texture
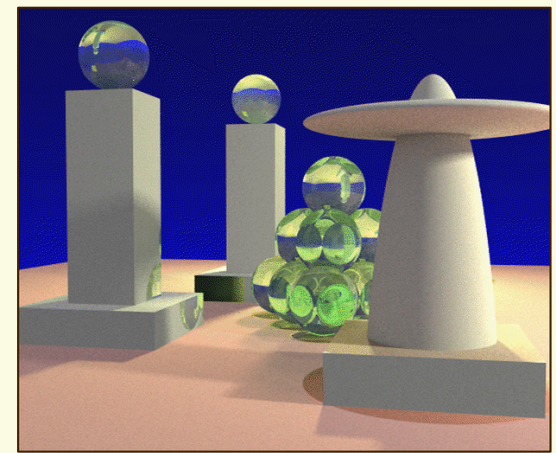
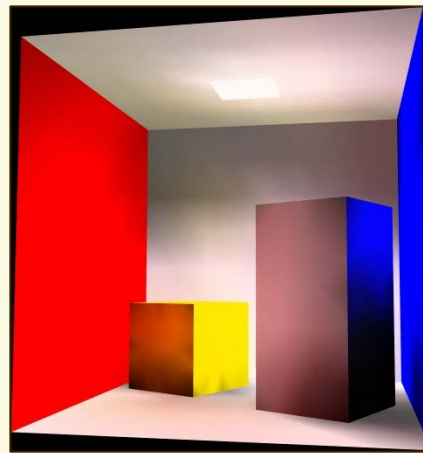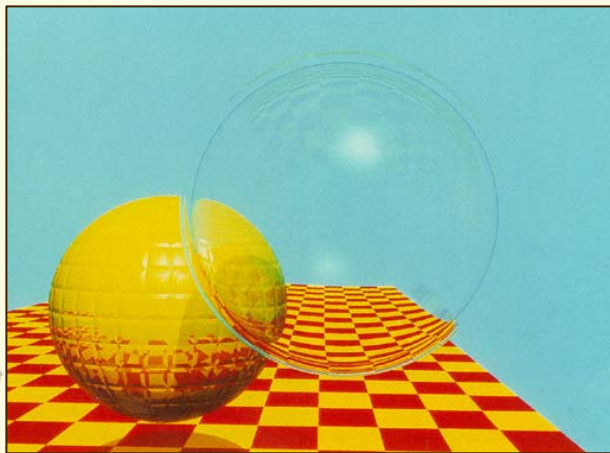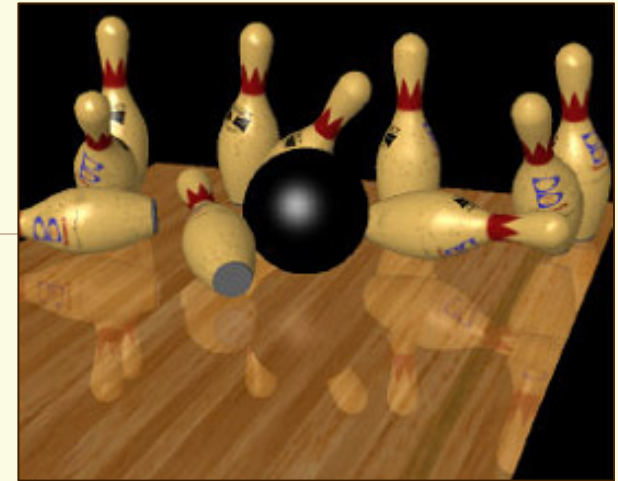– Crow (1977) - anti-aliasing

Warnock (1...

Sutherland (...

1970s - raster graphics

- Gouraud (1971) - diffuse lighting
- Phong (1974) - specular lighting
- Blinn (1974) - curved surfaces, texture
- Catmull (1974) - Z-buffer hidden-surface algorithm
- Crow (1977) - anti-aliasing

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early 1980s - global illumination

– Whitted (1980) - ray tracing

– Goral, Torrance et al. (1984), Cohen (1985) - radiosity

– Kajiya (1986) - the rendering equation
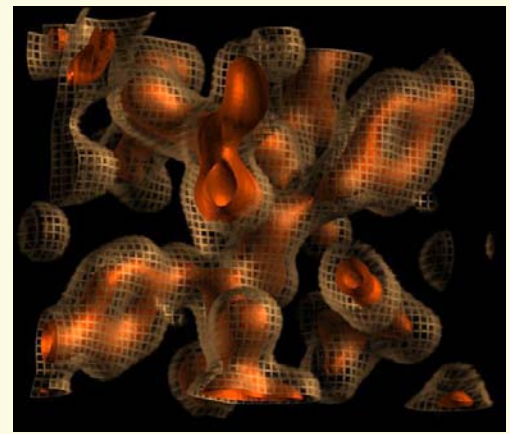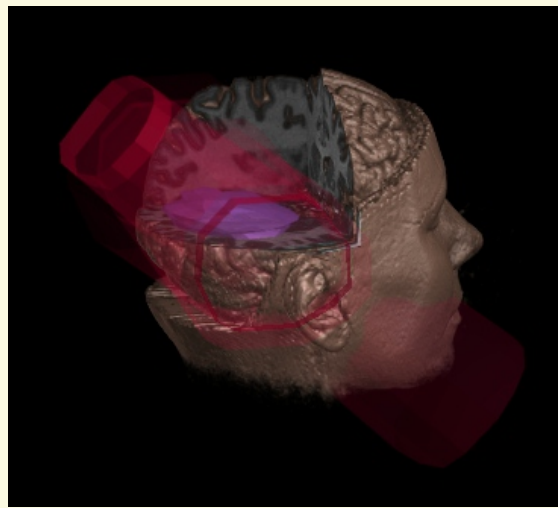
late 1980s - photorealism

- Cook (1984) - shade trees
- Perlin (1985) - shading languages
- Hanrahan and Lawson (1990) - RenderMan
    → shaders

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early 1990s - non-photorealistic rendering

- Drebin et al. (1988), Levoy (1988) - volume rendering
- Haeberli (1990) - impressionistic paint programs
- Salesin et al. (1994-) - automatic pen-and-ink illustration
- Meier (1996) - painterly rendering

early 1990s - non-photorealistic rendering

– Drebin et al. (1988), Levoy (1988) - volume rendering

– Haeberli (1990) - impressionistic paint programs

– Salesin et al. (1994-) - automatic pen-and-ink illustration

– Meier (1996) - painterly rendering