

CG

an almost factual account of the  
history of computer graphics

a long long time ago ...

before buzz ...

before quake ...

before microslot windows ...

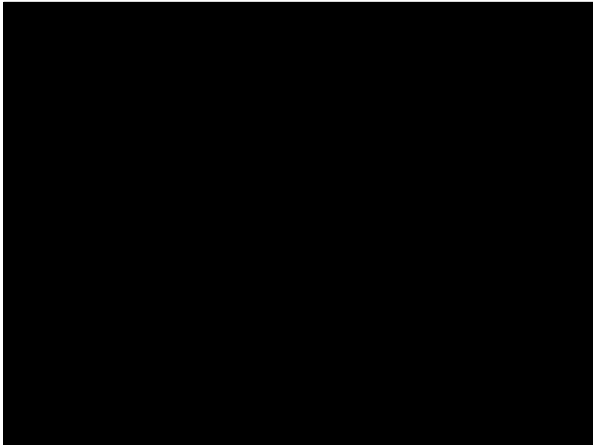
before most of you were born ...

the world existed without computer graphics

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hand-drawn  
graphics

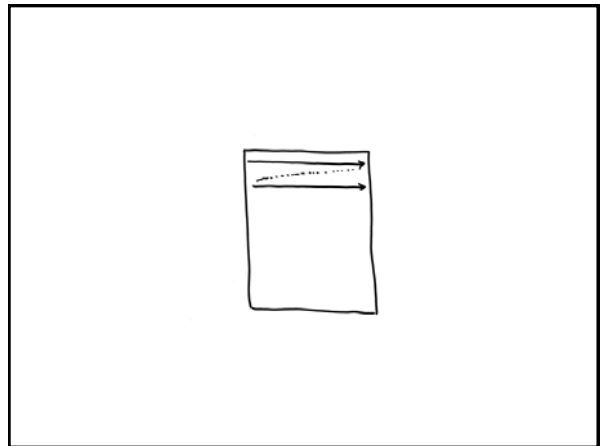
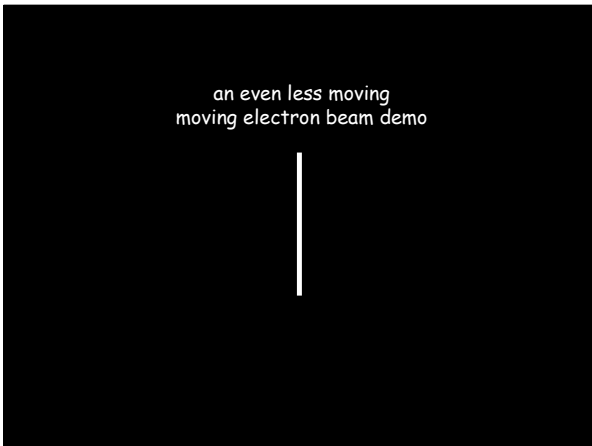
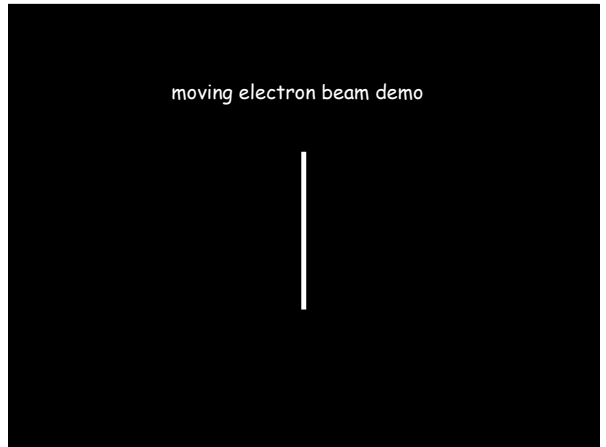
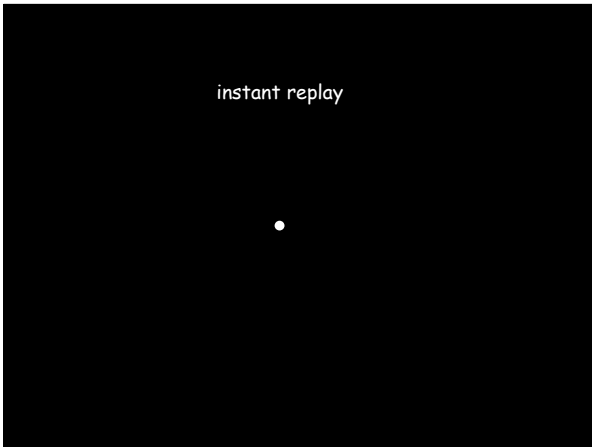
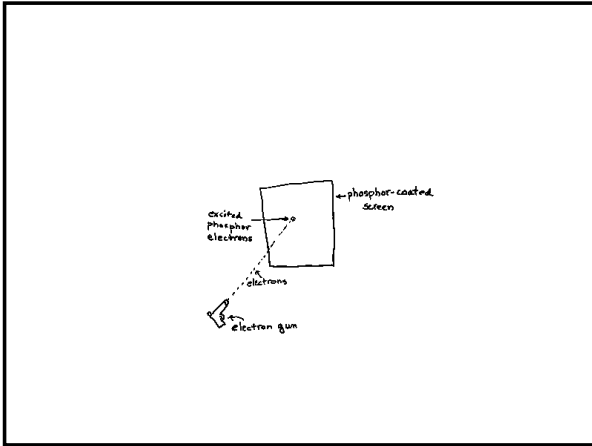


overhead projector game



x \_ \_ a s v \_ s b \_ \_

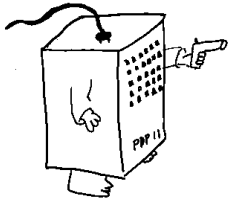
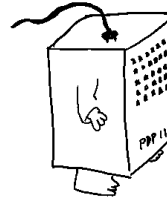
xsz+qvgbv



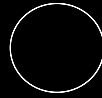
society would reap huge benefits ...



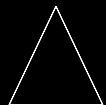
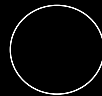
but that is a different story

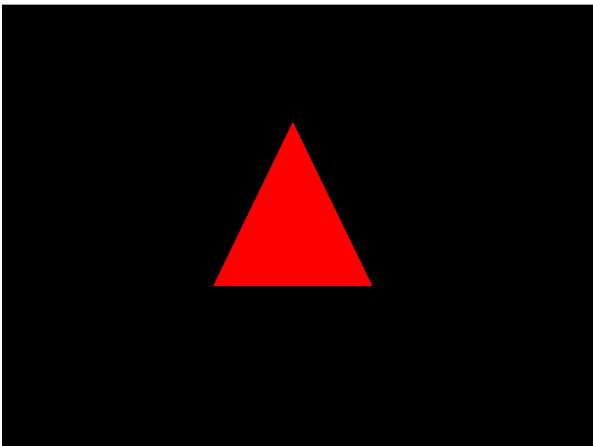
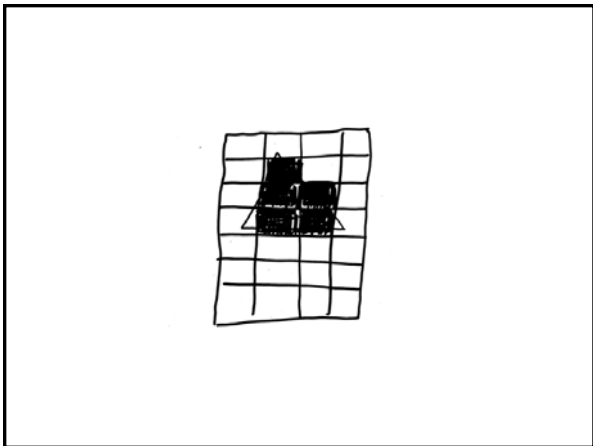
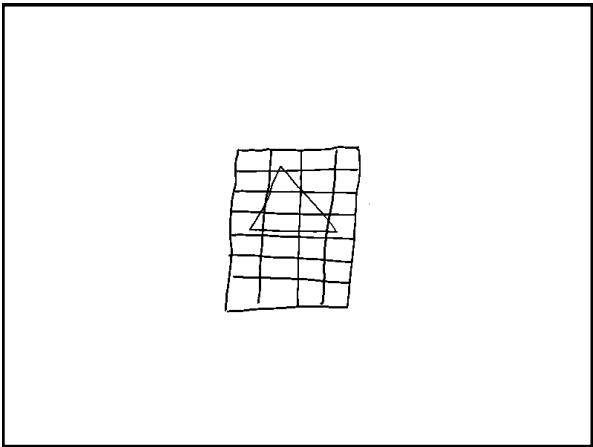
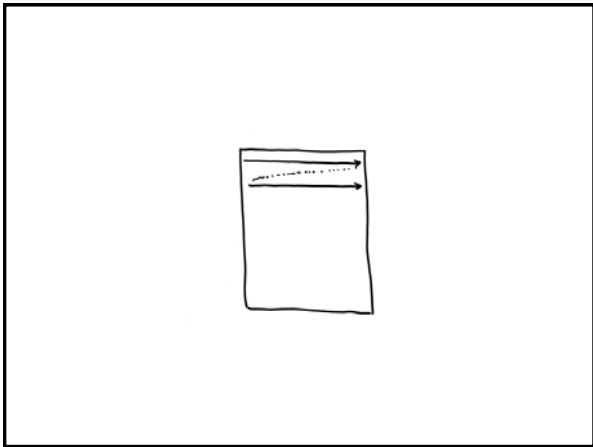
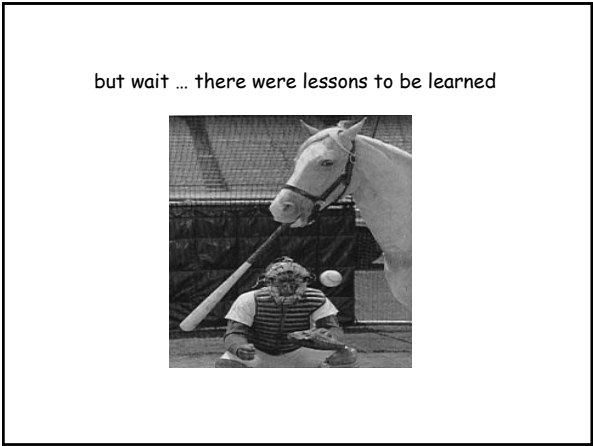
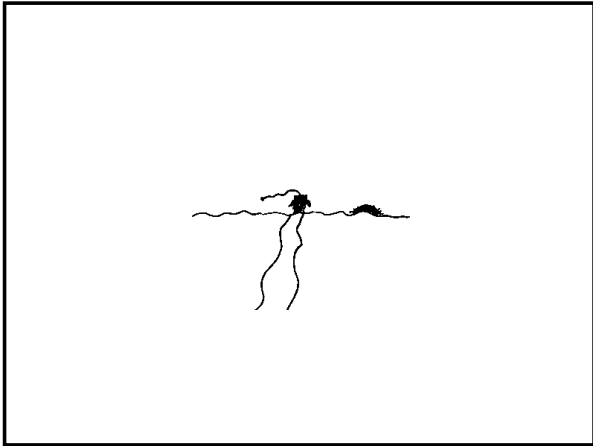


a fast draw

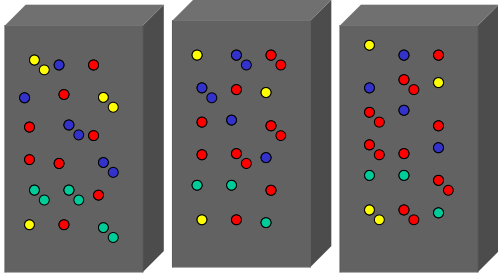


filled triangle

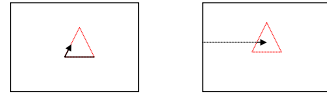




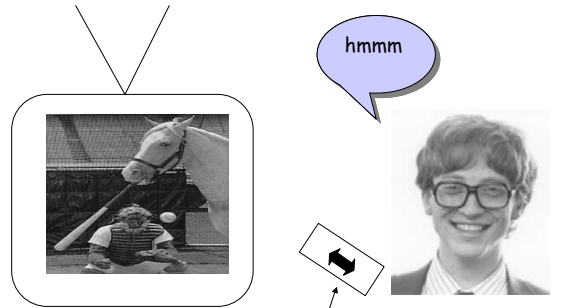
and it only took



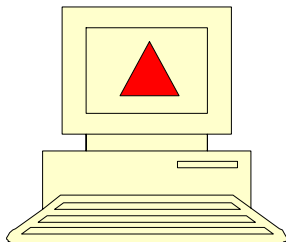
vector vs. raster graphics



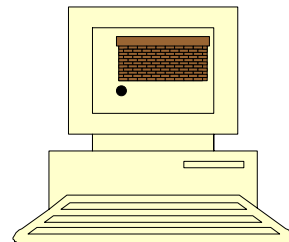
meanwhile  
back in cambridge



and a few years later...



and more



meanwhile  
back in hollywood

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## digital compositing

blend parts from different  
digital images to create a new  
image



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## more famous composites



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## and more



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## another technique: warping



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## morphing

transform one image  
into another by  
compositing and warping  
across time

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## morphing



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## computer graphics

2D image processing (synthesis)

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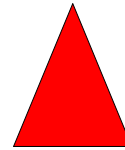
meanwhile  
back in utah

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## the lowly triangle



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## triangle mesh



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## triangle mesh



stanford michaelangelo project

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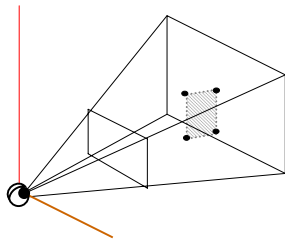
## the graphics pipeline

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## pipeline: build scene

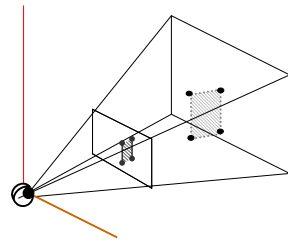


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## pipeline: project

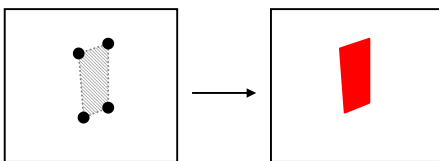


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## pipeline: scan convert



vertices in view plane

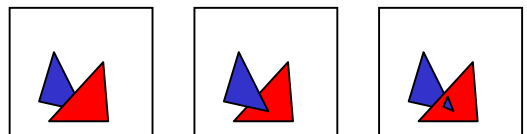
frame buffer

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## hidden surface removal



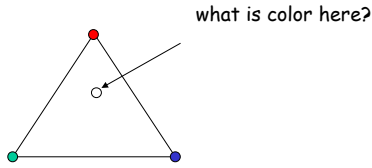
which is right?

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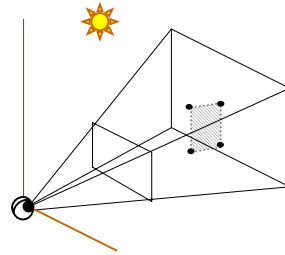
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# shading



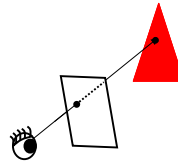
# local illumination



# the holy grail

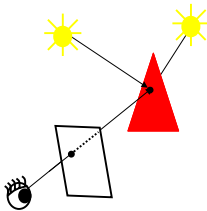
photo-realism

# ray tracing



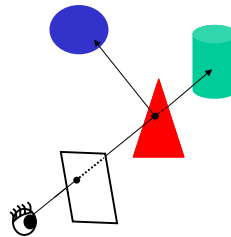
- cast ray through pixel into scene
- find intersection point (if any) that is closest to eye
- compute luminance at intersection

# luminance



- direct illumination from light sources
  - reflection off surface
  - transmission through surface
  - subject to occlusions

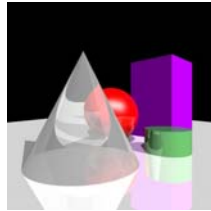
# luminance



- direct illumination
- inter-object specular reflection

## ray tracing

```
<scene>  
<cone material="glass">  
<sphere color="red">  
<box color="purple">  
<floor material="marble">  
</scene>
```



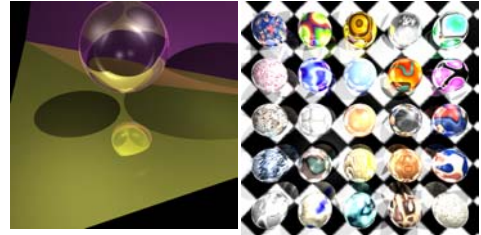
peter henry

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## ray tracing



andrew mcdonnell

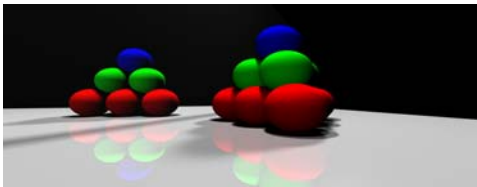
drew levin

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## ray tracing



jason wither

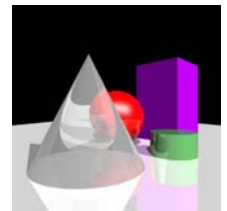
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## semi-local illumination

what is wrong with  
this picture?



peter henry

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## diffuse reflections



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## the holy grail

photo-realism

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## radiosity



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## computer graphics

1. image processing
2. rendering

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## polygon mesh



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## surface modeling



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## computer graphics

1. image processing
2. rendering
3. modeling
4. animation

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## computer graphics

1. image processing
2. rendering
3. modeling
4. animation

CS155: Computer Graphics

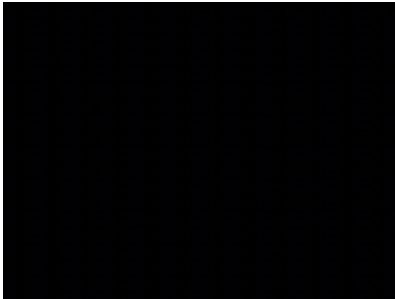
CS157: Computer Animation

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## a CS157 film



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## CS155 Prerequisites

- Linear algebra
- C++ programming
- Algorithms & data structures

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## warning

this class is a lot of work!! drop it now if

- you have a heavy load this semester
- you haven't had the prerequisites
- you aren't a capable programmer

P.S. this class is also a lot of fun!

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## basic course requirement

you cannot blow off any assignment

to pass the class you must submit a solution for each project that successfully implements at least 50% of the assigned features.

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## course info

[www.cs.hmc.edu/courses/year/semester/cs155](http://www.cs.hmc.edu/courses/year/semester/cs155)

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