CISC 440/640
Computer Graphics

Instructor: Christopher Rasmussen (cer@cis.udel.edu)

TA: Vincent Ly (vsector@gmail.com)

Course web page:

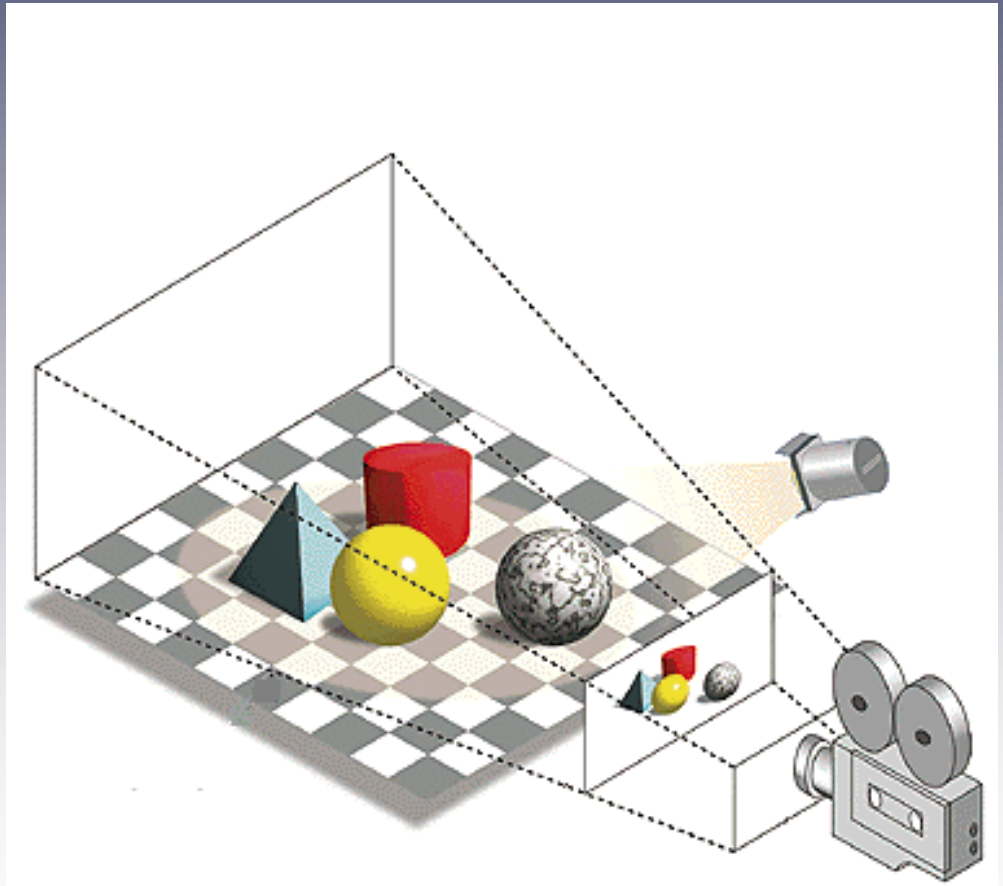
http://goo.gl/EB3aA

What's it all about?

- A first course in computer graphics covering fundamental concepts and techniques related to rasterization, textures, 2-D and 3-D transformations (including perspective projection), shading, hidden surface elimination, and anti-aliasing, as well as selected topics in modeling, animation, ray tracing, and global illumination
- Programs will be written in C/C++

What's it all about?

Rendering a 3-D scene to a 2-D image



The *inverse* of this is essentially **Computer Vision**

Readings

- Textbook: *Fundamentals of Computer Graphics*, 3rd ed., Peter Shirley *et al.*
  - Not in bookstore—get from Amazon or CRC site
- Online reading: *OpenGL Programming Guide* (aka the "Red book"), M. Woo, J. Neider, & T. Davis

Grading

- 60% 4 equally-weighted programming assignments (2 weeks each)
  - HW #1: assigned Feb. 14 $\rightarrow$ due Feb. 28
  - HW #2: Mar. 1 $\rightarrow$ Mar. 15
  - HW #3: Apr. 12 $\rightarrow$ Apr. 26
  - HW #4: May 1 $\rightarrow$ May 15 (last day of classes)
- 20% Midterm exam (March 22, just before spring break)
- 20% Final exam (not cumulative)
- 2% Extra credit: complete evaluation

More about homeworks

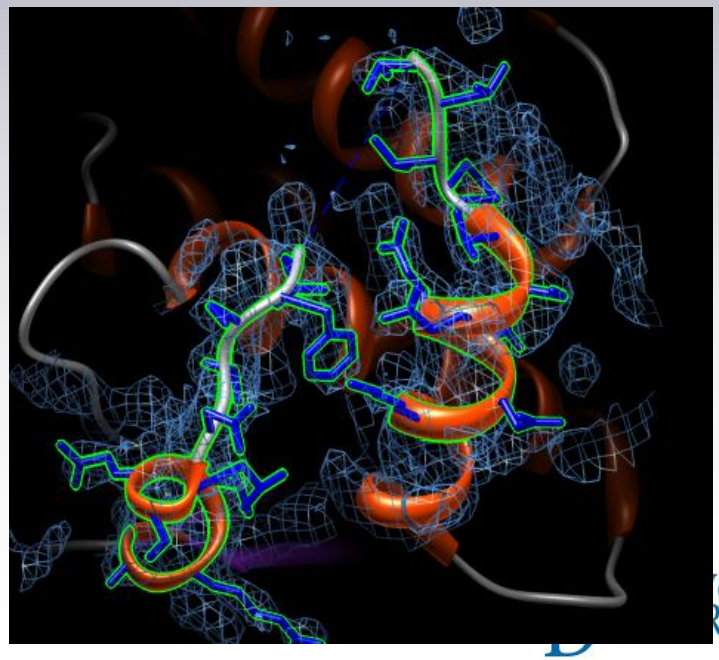
- HW's are due at midnight on deadline day
- You have 6 free late days to use for the whole semester (3 max per assignment)
- Submit and view grades on **Sakai**
  - This will be only use of Sakai for course
- See course page for more details

Questions…

- As much as possible, I'd like to handle questions about homeworks and course issues on **Piazza** rather than through e-mail
- Feel free to contribute your own answers to other students' questions there
- Don't post code—explain!

What Is Computer Graphics? **Applications**

- Graphic art/fine art
- Entertainment, training/simulation
  - Animated films
  - Special effects
  - Games
- Science & engineering
  - Computer-aided design
  - Visualization
  - Medical imaging



What is Computer Graphics? **Goals**

Reproducing reality: Appearance

What is Computer Graphics? **Goals**

Reproducing reality: Motion

From http://physbam.stanford.edu/~fedkiw/

What is Computer Graphics? **Goals**

Reproducing reality: Motion

What is Computer Graphics? **Goals**

Simulating natural phenomena

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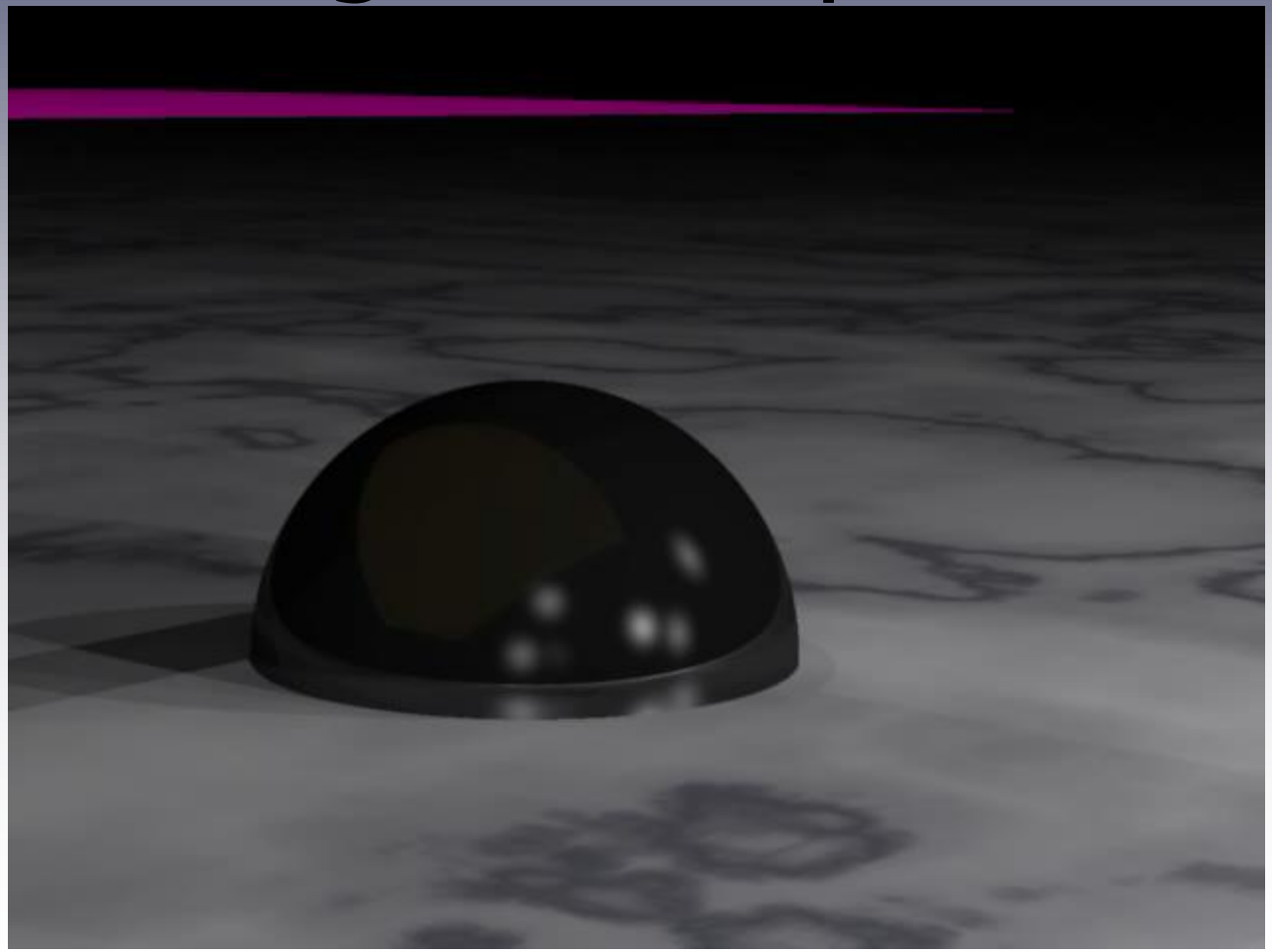
What is Computer Graphics? **Goals**

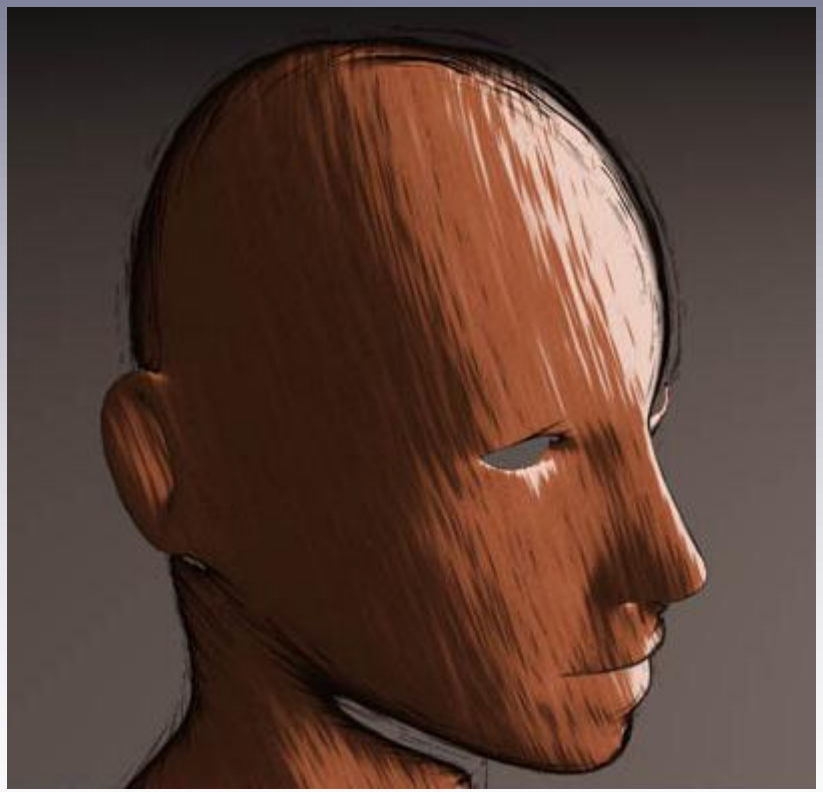
Simulating natural phenomena



From http://physbam.stanford.edu/~fedkiw/

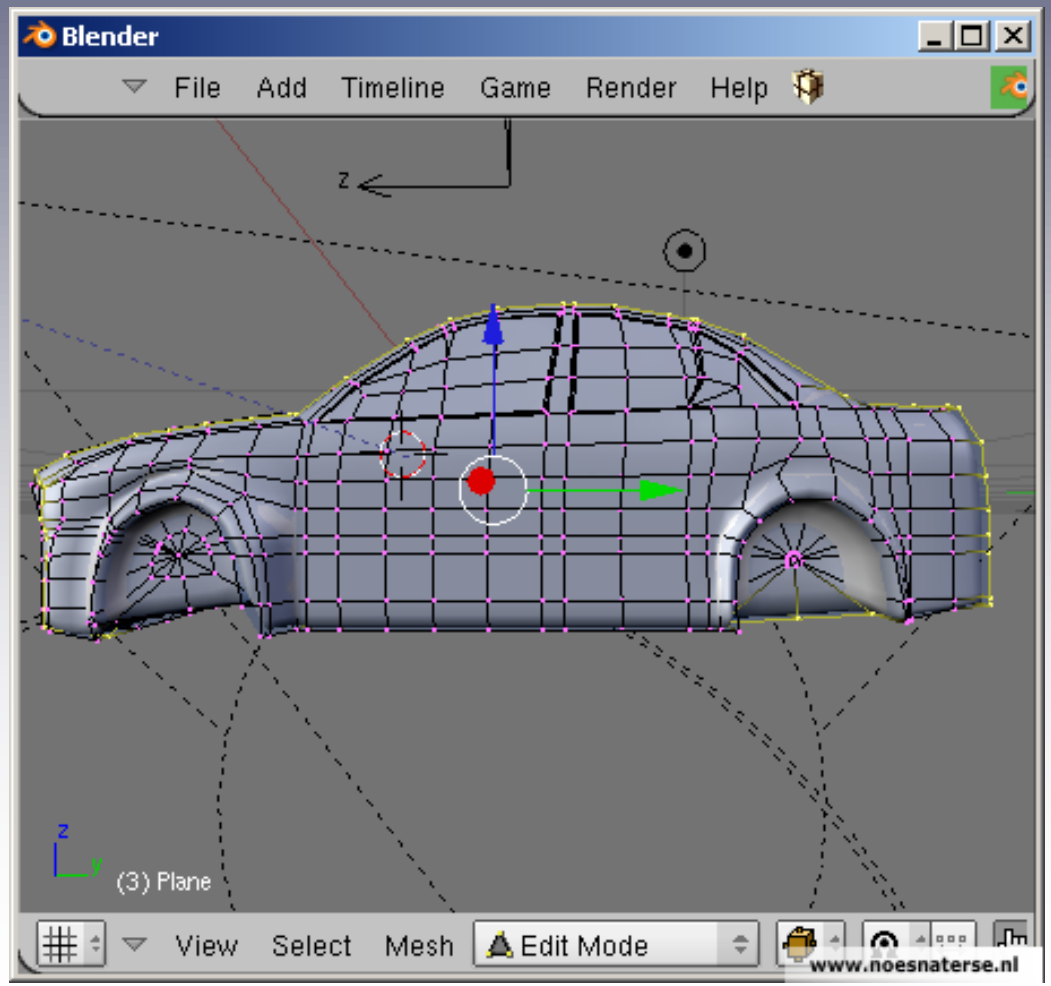
What is Computer Graphics? **Goals**

"Nonphotorealistic" rendering



What is Computer Graphics? **Goals**

Design & modeling: Manual



What is Computer Graphics? **Goals**

Design & modeling: Procedural

What is Computer Graphics? **Goals**

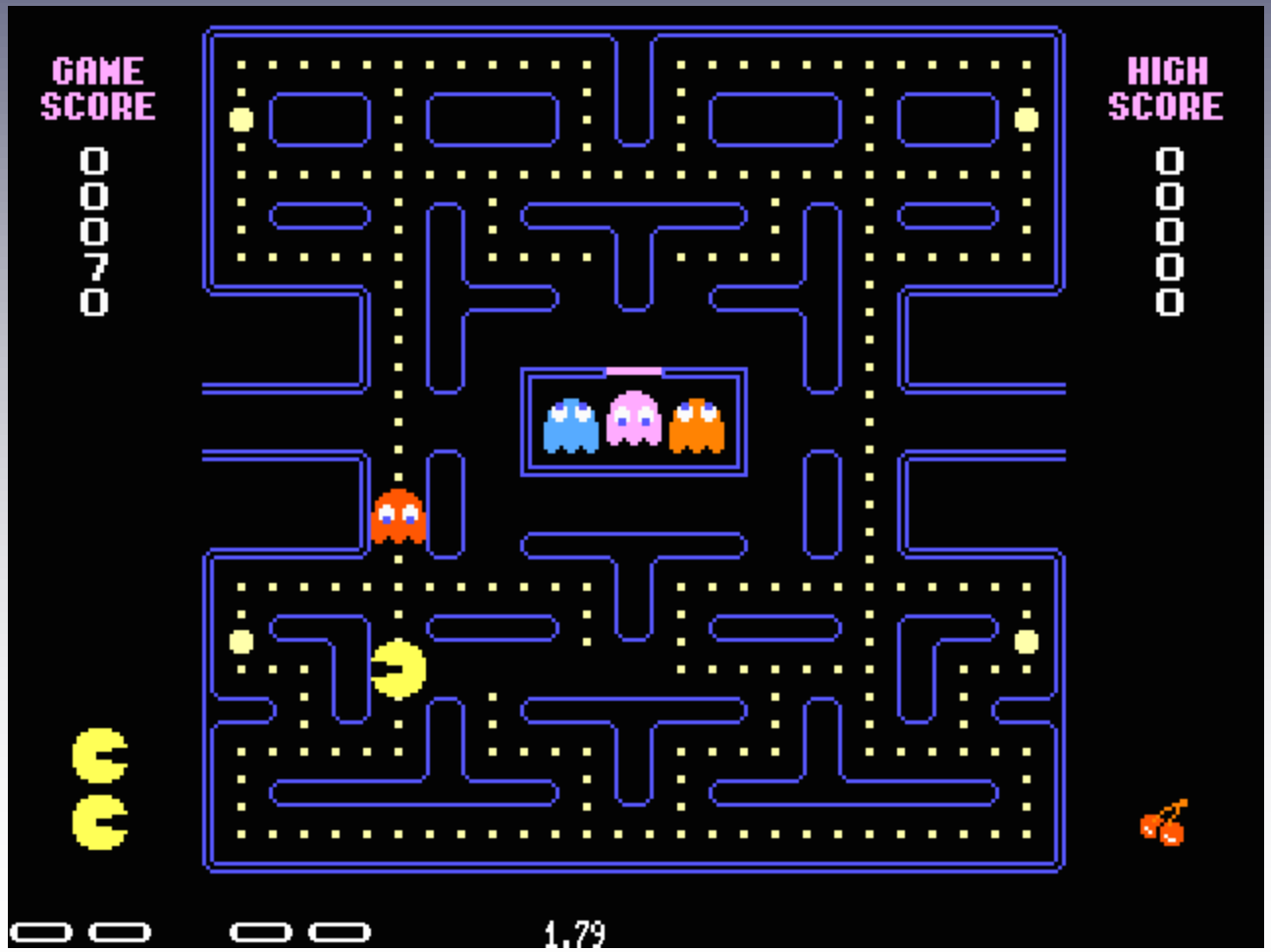
More procedural modeling

What is Computer Graphics? **Goals**

Procedural motion: Flocking/crowds

What is Computer Graphics?

Games

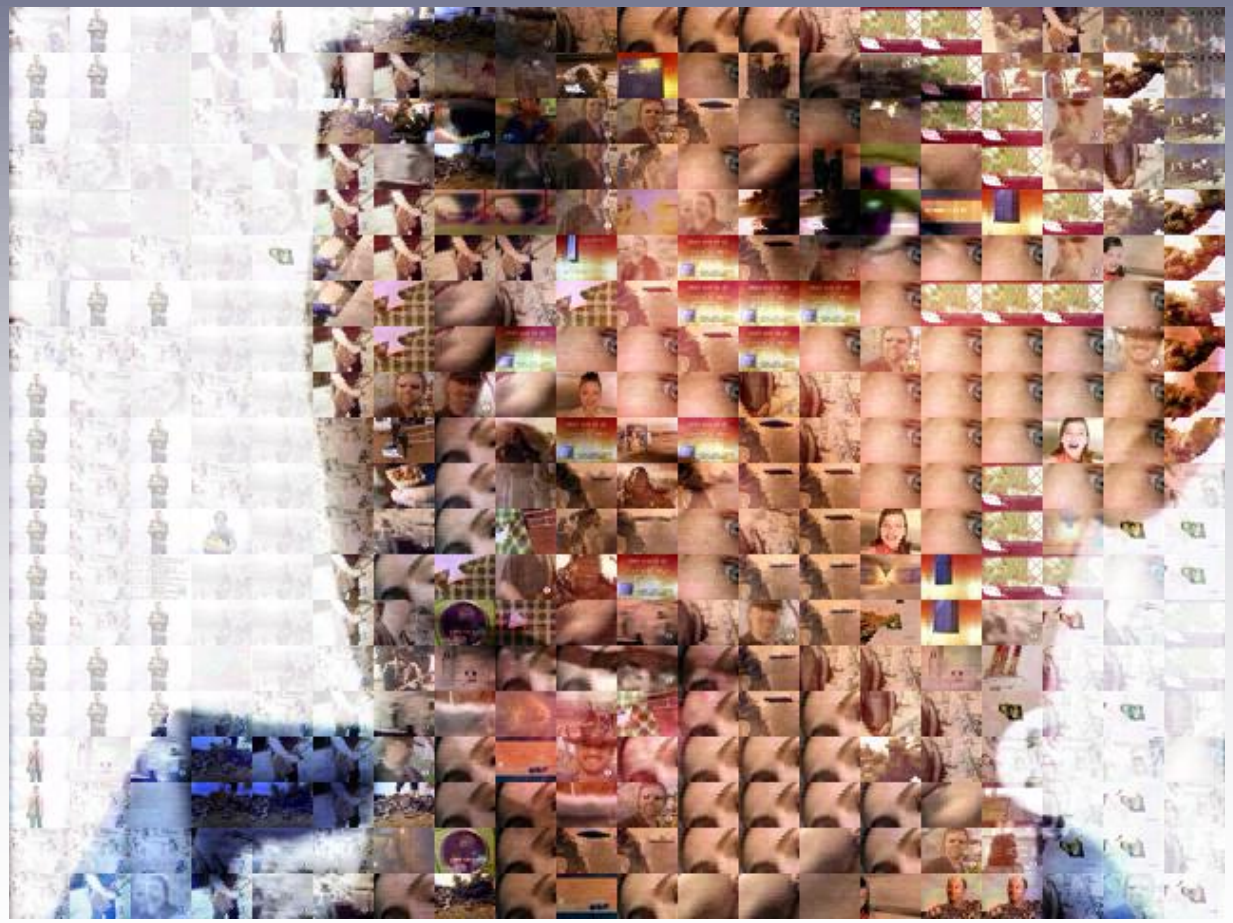


What is Computer Graphics?

Games

What is Computer Graphics? **Techniques**

Image-based rendering (mosaicing)



From http://www.cs.princeton.edu/gfx/pubs/Klein_2002_VM/index.php/

What is Computer Graphics? **Techniques**

Image-based rendering + computer vision

(through beginning of Prague section)

Course Topics: Issues and algorithms

- **OpenGL/GLUT**: Basic drawing, interaction, animation
- **Rasterization**: Which pixels to fill in when we draw a line? a circle? etc.
- **Motion**: Basic physics simulation, procedural "behaviors"
- **2-D & 3-D Geometry**: Coordinate systems, transformations, cameras
- **Clipping & hidden surface elimination**: Not everything is visible…
- **Shading**: Light, surfaces, and approximations of how they interact
- **Ray tracing & global illumination**: Efficiently simulating how light travels though certain classes of scenes
- **Textures**: Pixel arrays pasted on surfaces, plus more general uses
- **GPU programming**: Basics of programmable shaders

Getting ready for HW #1

- Platform = OS + compiler + libraries/headers
- Recommend Linux or Unix (including MacOS)—all examples will be with Makefiles
  - cygwin makes Windows somewhat Unix-like
  - Dual-booting is easy! VirtualBox is alternative…
  - Visual Studio/Xcode/Eclipse ok if you work it out with TA
- Need to get OpenGL installed or tested
  - Try hello.cpp, other examples linked on course page
- See course page for more details

NO CLASS Feb. 16 & 21 – I am out of town