CS 433/433H, 533

Instructor: Kobus Barnard

Office: GS 730

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Office Hours: Thursday 5-6 (may switch to Tuesday)

Why graphics?

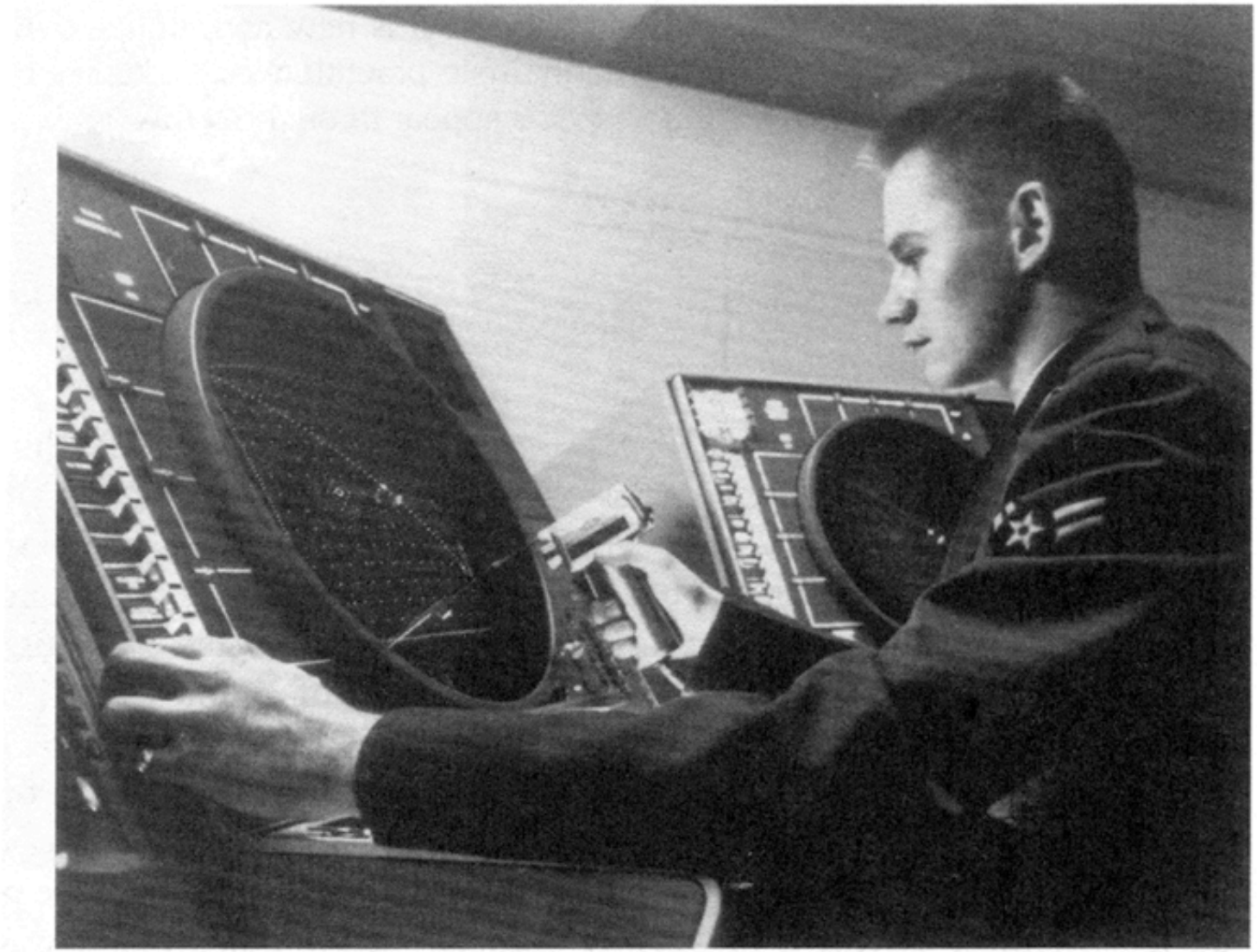
- Presenting an alternative world
- Visual interfaces
- Enhancing our view of the existing world

Presenting an alternative world

- For training
  - E.g. Landing expensive aircraft
- For amusement
  - Games; movies
- For aesthetic pleasure
  - Computer art
- For understanding
  - Display data sets in an accessible way (e.g. in book)

Interaction

- Key to the games industry
- Key to most current user interfaces
- Idea dates back to ‘55, at least
- Sketchpad was the first interactive graphics system where user could author displays (‘63 thesis, Ivan Sutherland)

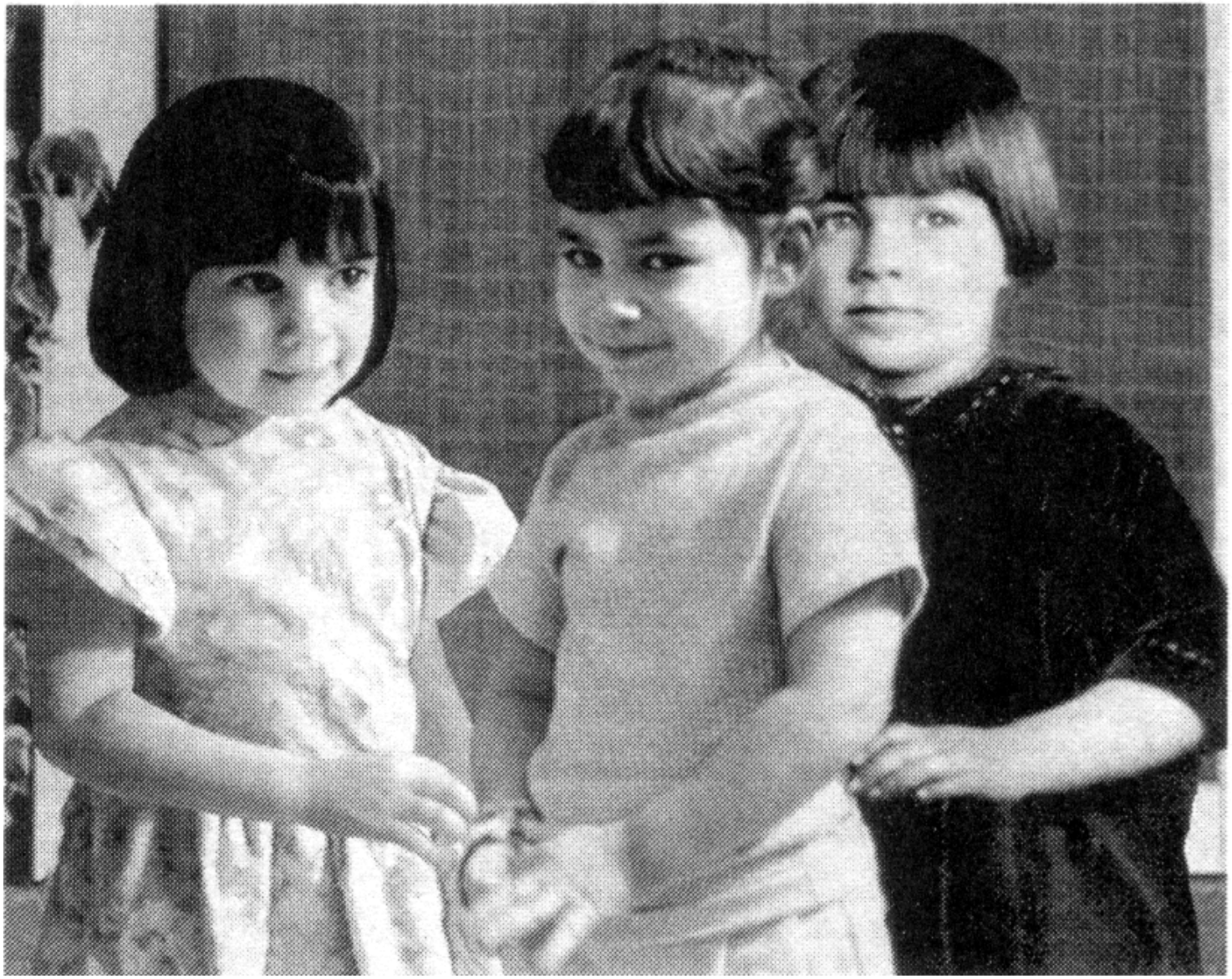


SAGE - aircraft target selection - 1958, from Spalter

Sketchpad, c 1955, from Spalter

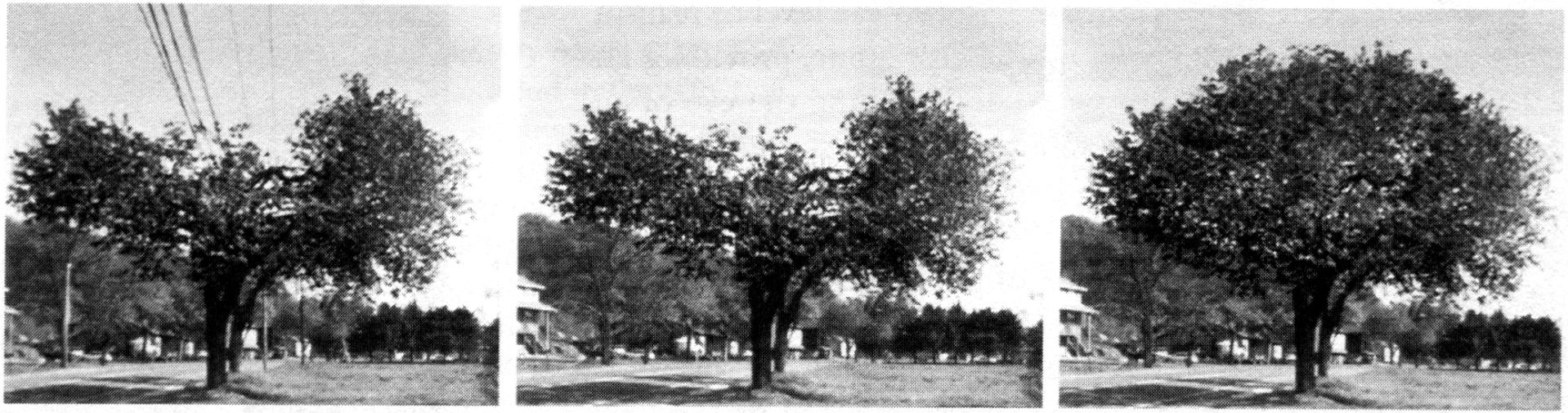
Computer Art

- 2D graphics lends itself particularly well to sophisticated collages
  - Image editing and composition tools
  - Computer paint programs
  - User interfaces are improving - pressure sensitive tablets, etc.



Me, My Mom and My Girl at Three, 1992, Michele Turre

You Wish, from Tree Fix, 1997, Michele Turre



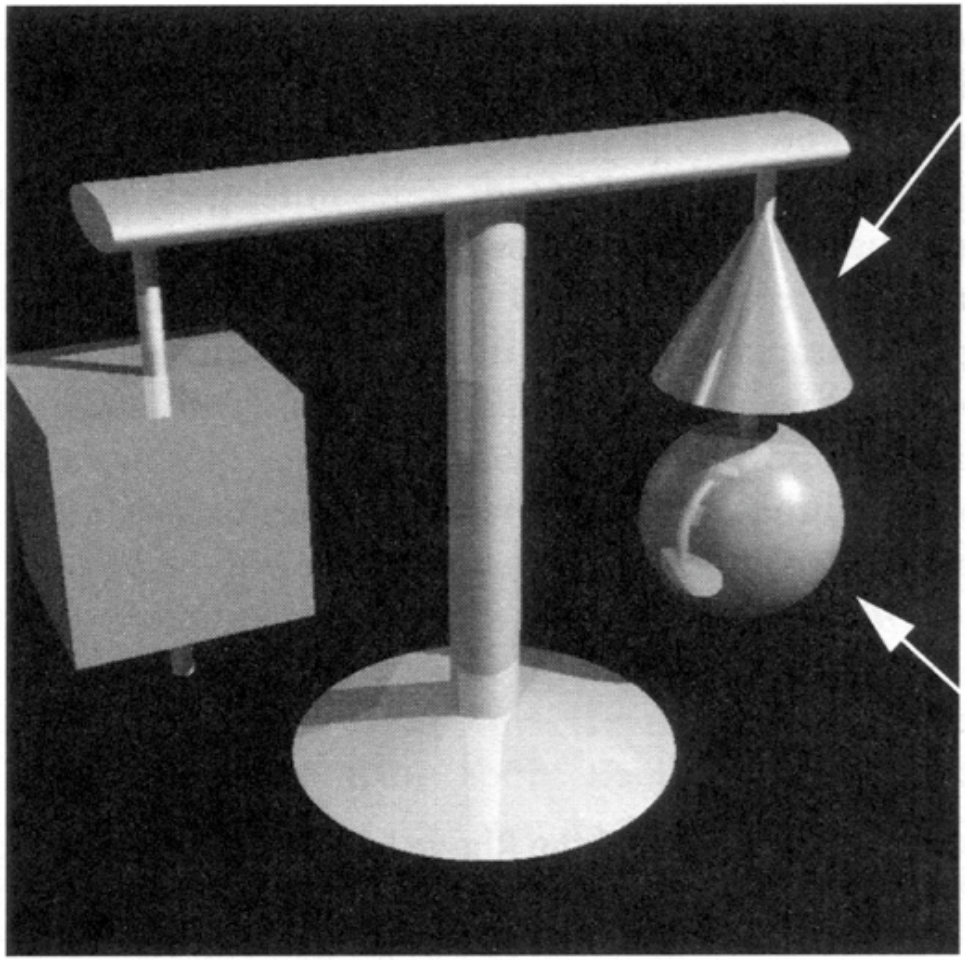
Enhancing the existing world

- Mix models with the real world
  - Movies!
- Allow operation planning
  - Neurosurgery
  - Plastic surgery
- Add information to a surgeons view to improve operation
  - Neurosurgery

From Eric Grimson's research group at MIT

Rendering takes a model to a picture

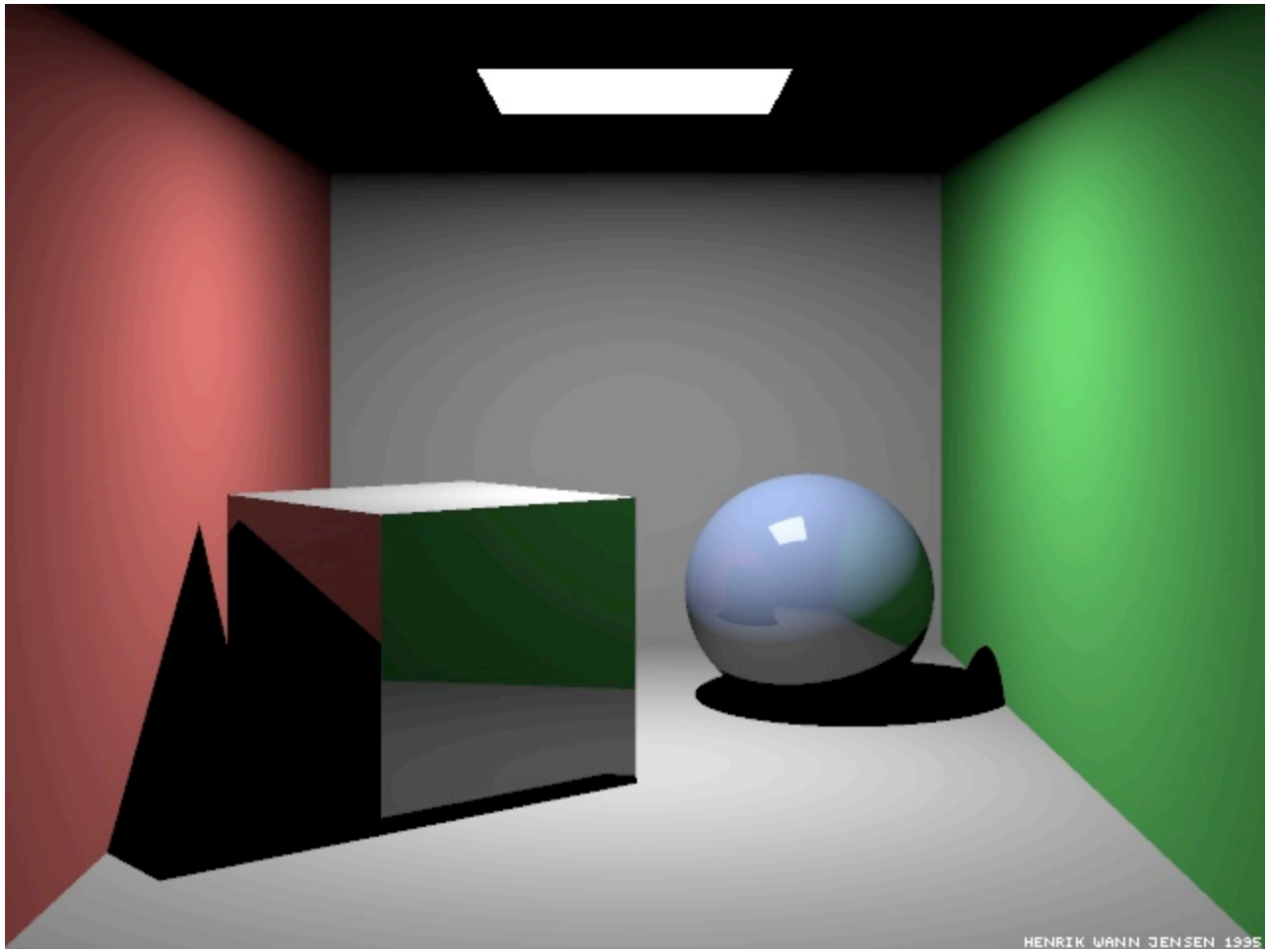
```
trans [
scale 1.03 1.03 1.03
translate -1.55 0.29 0
object cube [
diffuse 0.9 1 0.9
ambient 0.06 0.05 0.07
specular 0.9 0.9 0.9
reflect 0.38 0.38 0.38
shine 30
]
]
```



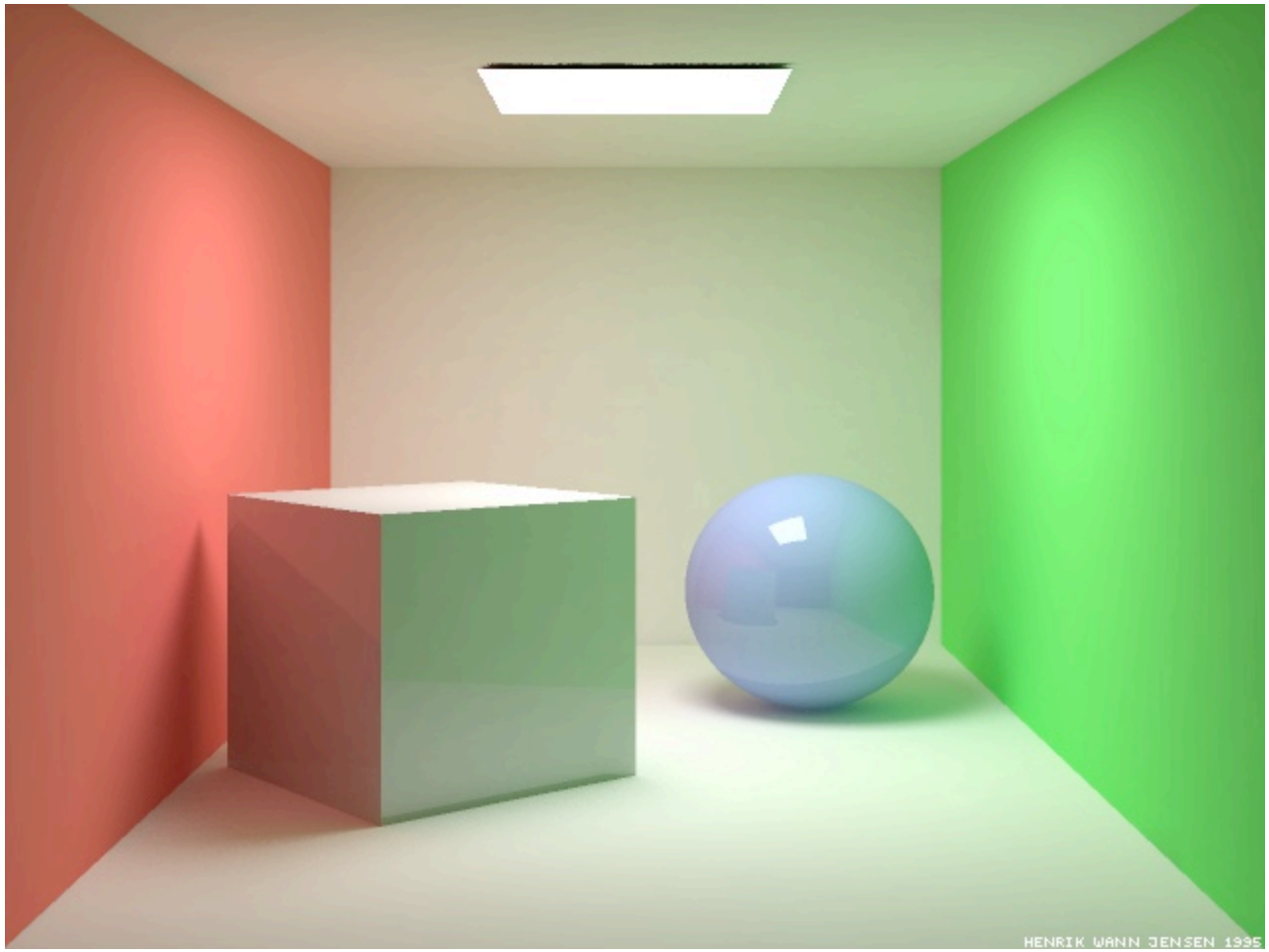
```
trans [
translate 1.55 0.74 0
scale 1.04 0.93 1.04
object cone [
diffuse 0.9 1 0.9
ambient 0.06 0.05 0.07
specular 0.9 0.9 0.9
reflect 0.47 0.47 0.47
shine 30
]
]
```

```
trans [
translate 1.55 -0.53 0
scale 1.1 1.1 1.1
object sphere [
diffuse 0.9 1 0.9
ambient 0.06 0.05 0.07
specular 0.9 0.9 0.9
reflect 0.42 0.42 0.42
shine 30
]
```

PCKTWTCH by Kevin Odhner, POVRay

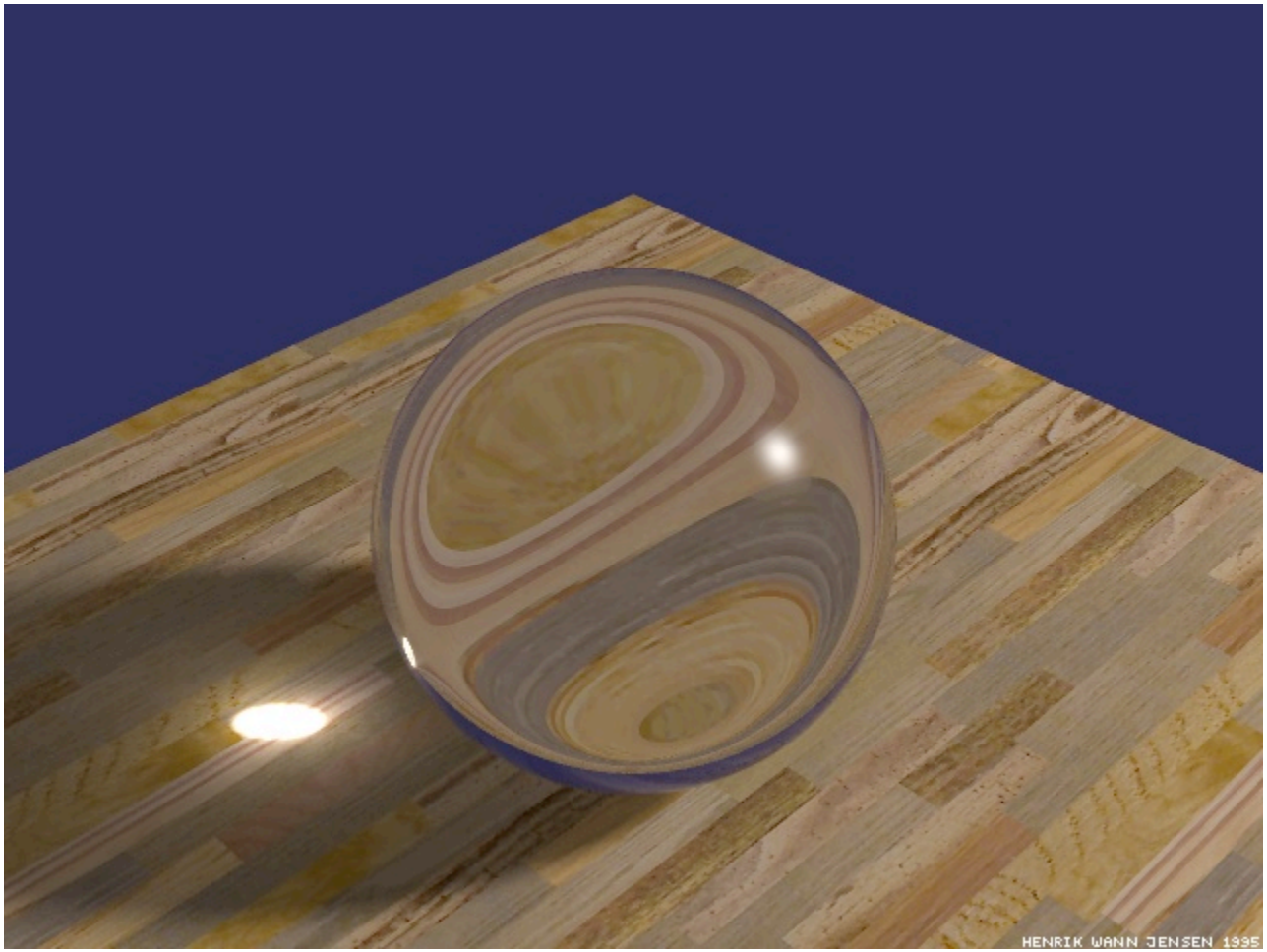


Ray-traced Cornell box, due to Henrik Jensen, http://www.gk.dtu.dk/~hwj



Radiosity Cornell box, due to Henrik Jensen,
http://www.gk.dtu.dk/~hwj, rendered with ray tracer

Refraction caustic



Henrik Jensen, http://www.gk.dtu.dk/~hwj

Refraction caustics

Henrik Jensen, http://www.gk.dtu.dk/~hwj

Resources

http://www.cs.arizona.edu/classes/cs433/fall03/index.html

Lectures (preview, postview), assignments

OpenGL information

TA

Kevin Wampler (wamplerk@cs)

Proposed office hours: Monday, 3-4, and Thursday 5-6

Course Outline

(not exactly in order!)

- Intro (1 week)
  - Math review
- Rendering (6 weeks)
  - Proceeding from a geometrical model to an imageInvolves understanding
    - Displays
    - Geometry
    - Cameras
    - Visibility
    - Illumination
  - Technologies
    - the rendering pipeline
    - ray tracing
- Modelling (3 weeks)
  - Producing a geometrical, or other kind of model that can be rendered.
  - Involves understanding
    - Yet more geometry
    - A little calculus
- Misc (2-3 weeks)
  - colour
  - animation
  - advanced rendering
- Exam, review (1 week)

Grading, etc.

Bad attendence lowers grade

Assignments will count for a large part of grades

Projects can be substituted for assignments (with permission).

Grad students will do assignments at an accelerated pace and must do a project (preferably research oriented)

Honors students?

Late policy (5% off per day until way too late)

We will check assignments for duplication

Administrative

Please do “Apply”--it is needed for CAT card access to graphics lab.

Graphics lab (BSE 328)--under construction, almost finished

I need your E-mail--check it on the list; if you are not on the list because your paperwork has not yet perculated through the system, add your name and E-mail at the bottom of the list.

Administrative

Unix versus windows: Graphics machines are now all Red Hat. If you want to reboot in windows, use the next available one with the highest number--i.e., make “graphics11” windows before “graphics10”. If “graphics11” is being used, then use “graphics10”, etc.

If you develop on windows, you must check that your code compiles and runs on linux.

Check the class page regularly for announcements. (http://www.cs.arizona.edu/classes/cs433/fall03/index.html)