Introduction to 3D Graphics

CS 355: Introduction to Graphics and Image Processing
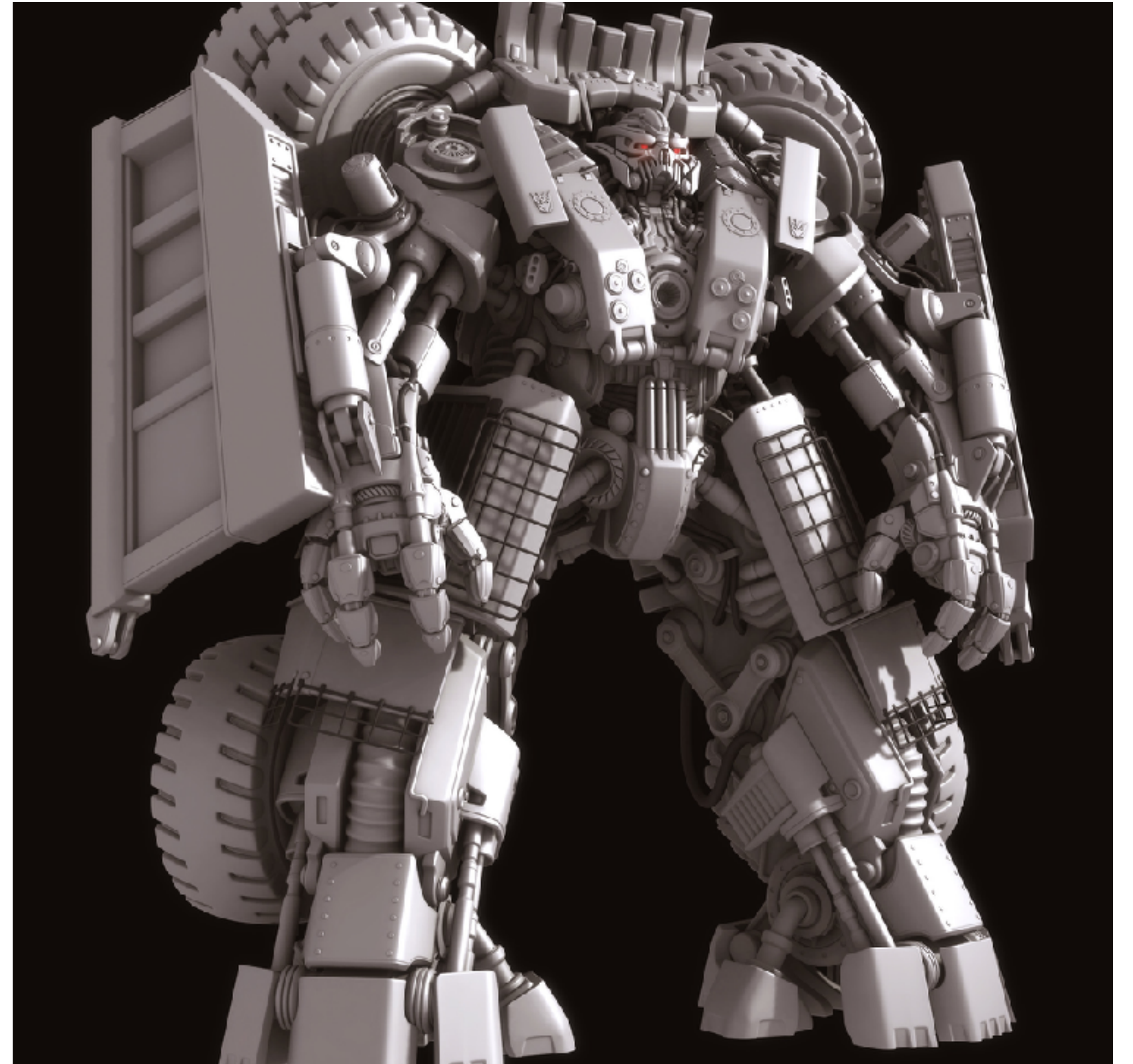
3D Rendering

- If I took a picture of a scene with a virtual camera:

  - What point in 3D is visible at each 2D point in the projected image?

  - What color is the light coming from that point as it reaches the camera?

It All Starts With Models

- Can be quite complex

- Ways to create:
  - By hand
    (interactive software)

  - Scanning
    (existing model, sculpting)

  - Image-based
    (from photographs)

- Time intensive = $$$

3D Animation

- Modeling

- Rigging

- Animation

- Physical Simulation

- Lighting
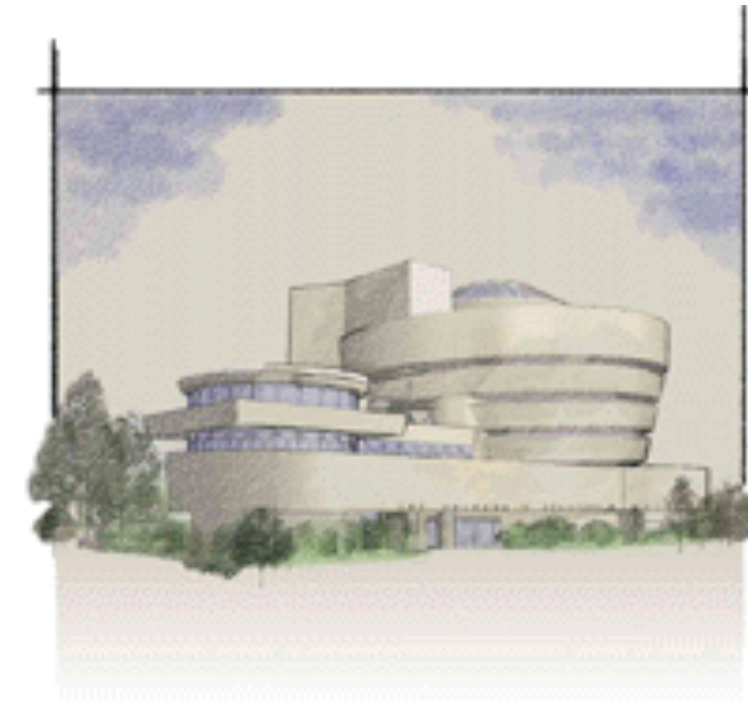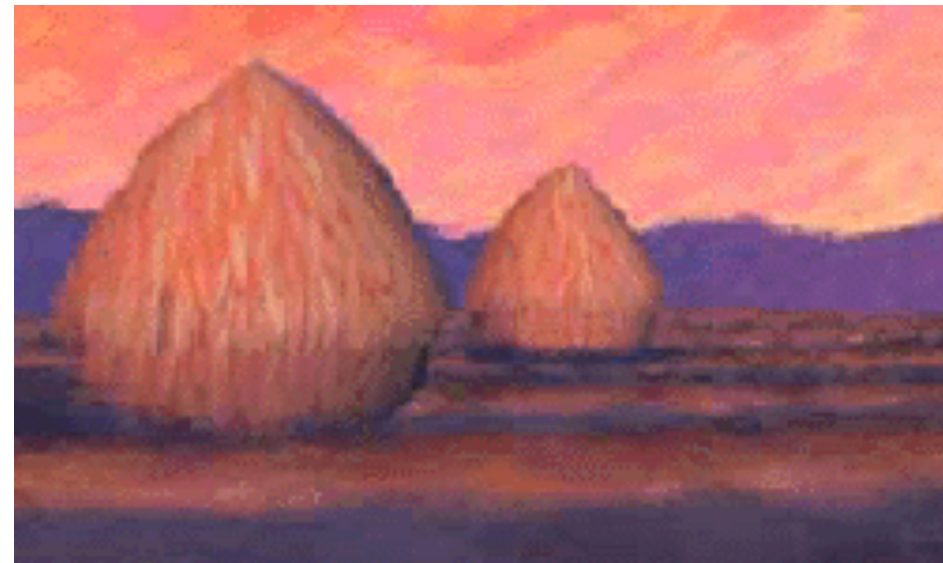
- Rendering

- Compositing

Special Effects

- Usually a combination of *real filmed elements* and *computer-generated*

- Virtual camera must be at *exactly position of the real one*

- Position of CGI elements must be right in "real" world

- May involve not only adding new elements but also removing ones in the real scene (green screen, wires, unwanted background, etc.)
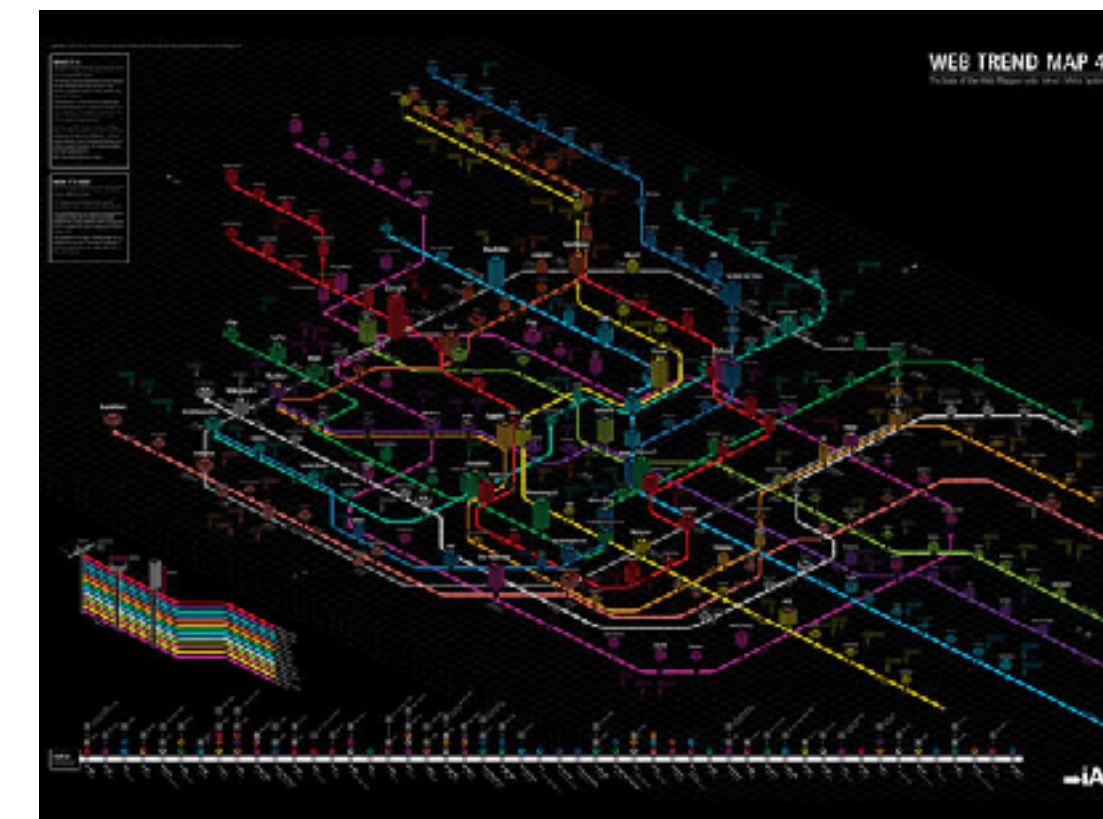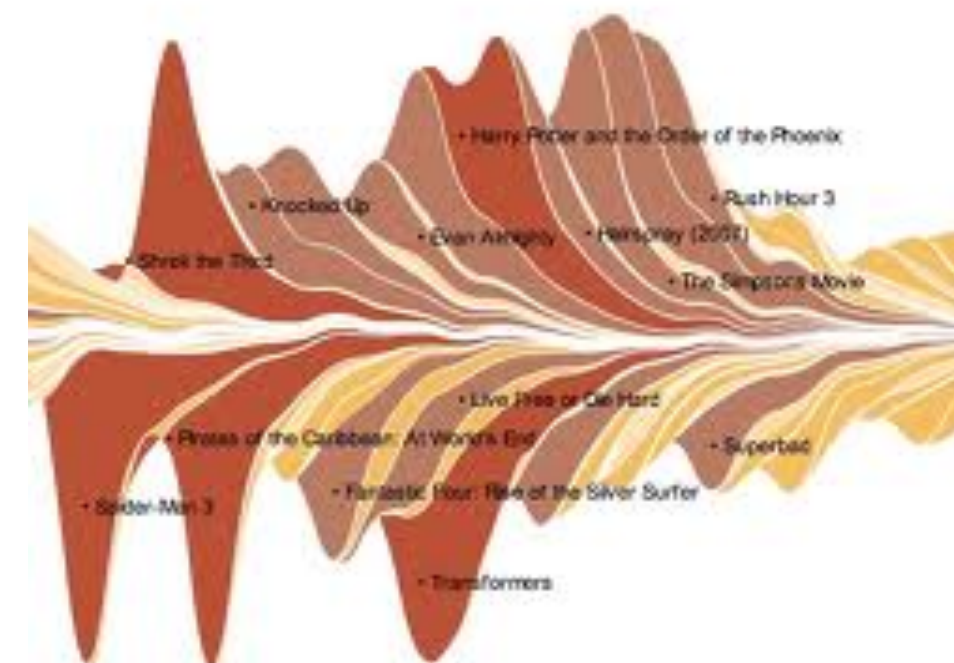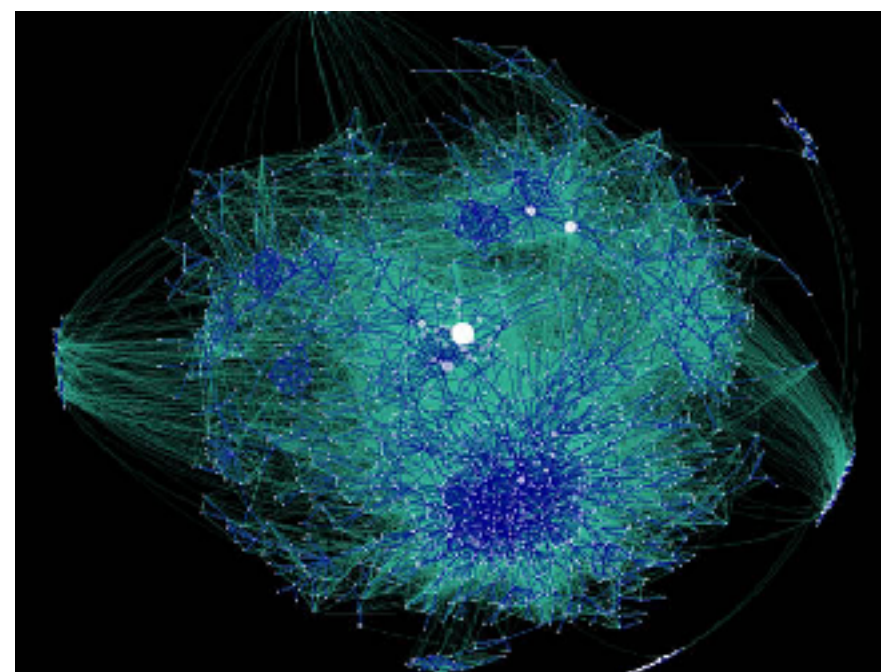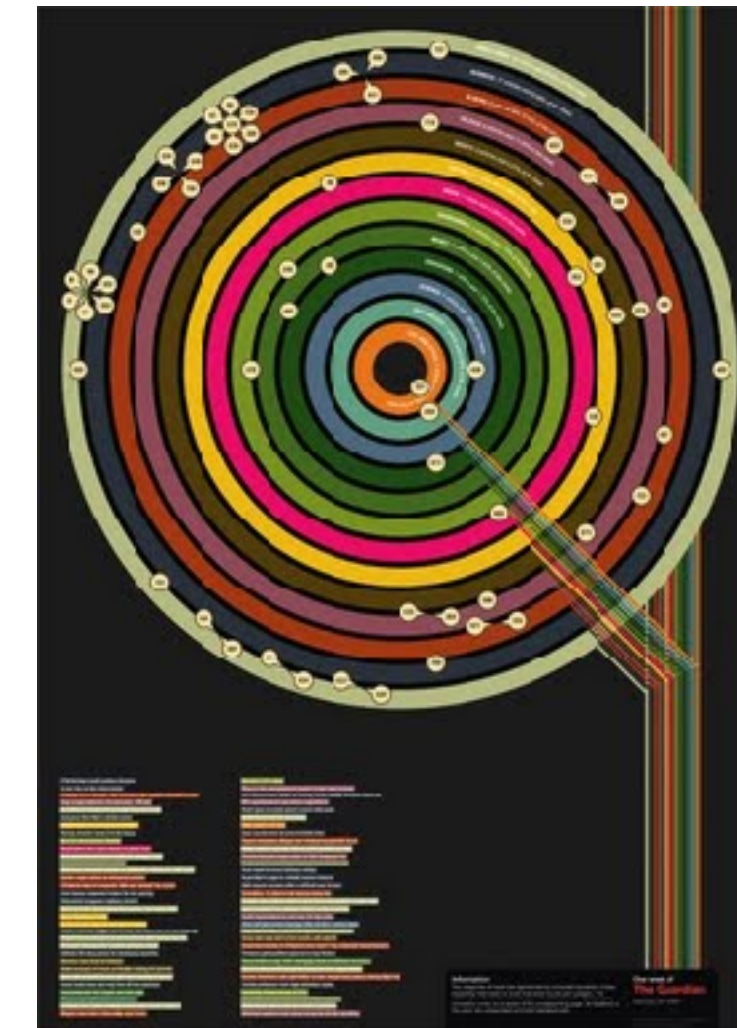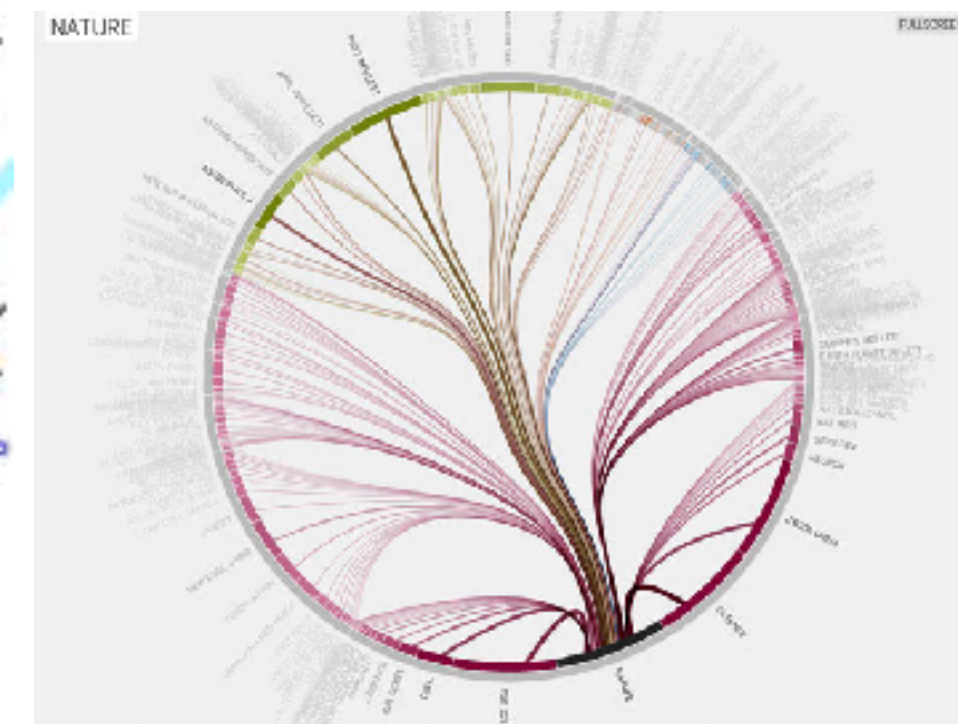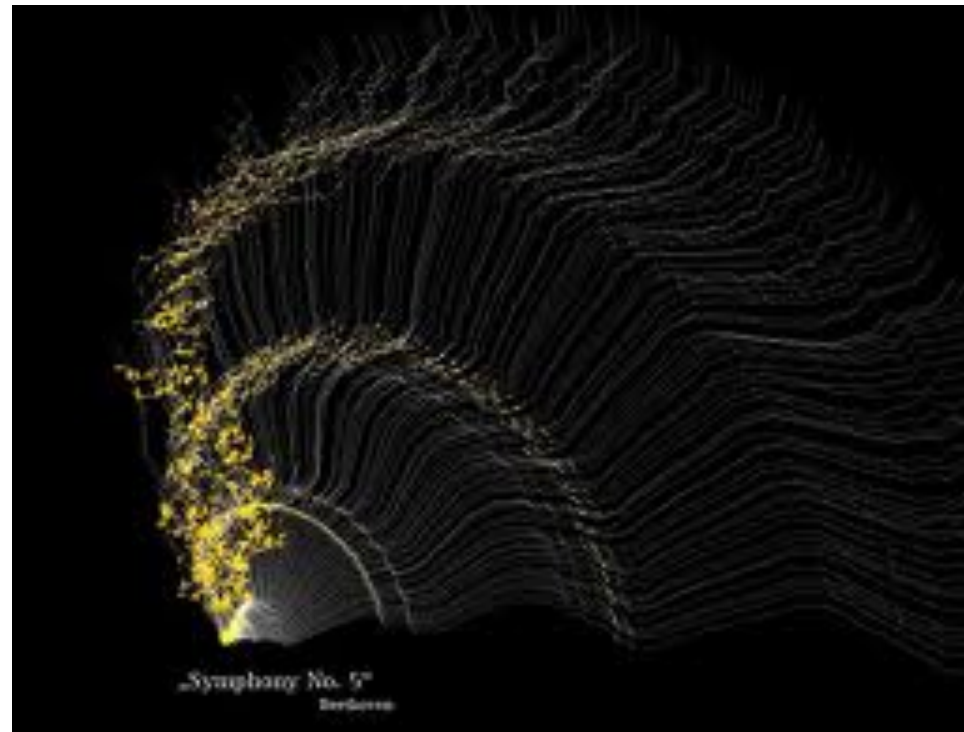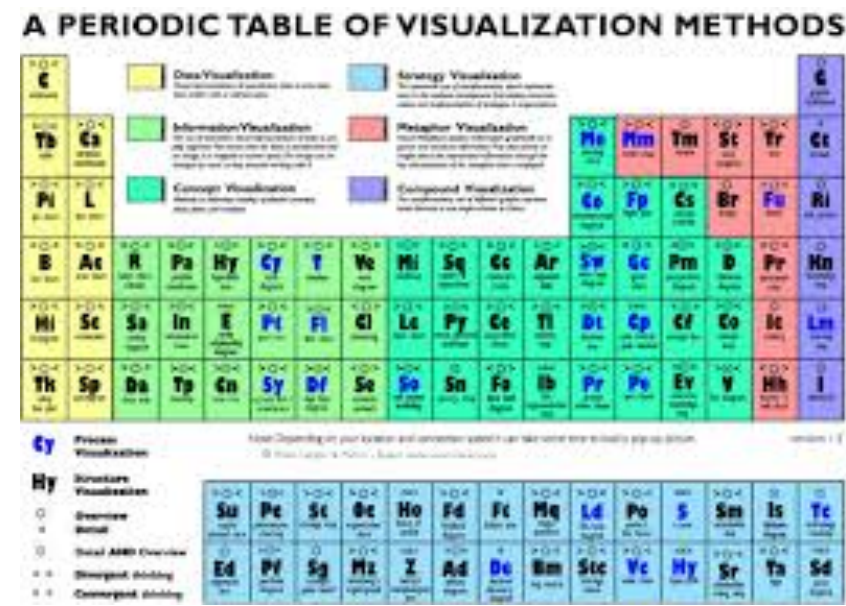
Nonphotorealistic Rendering
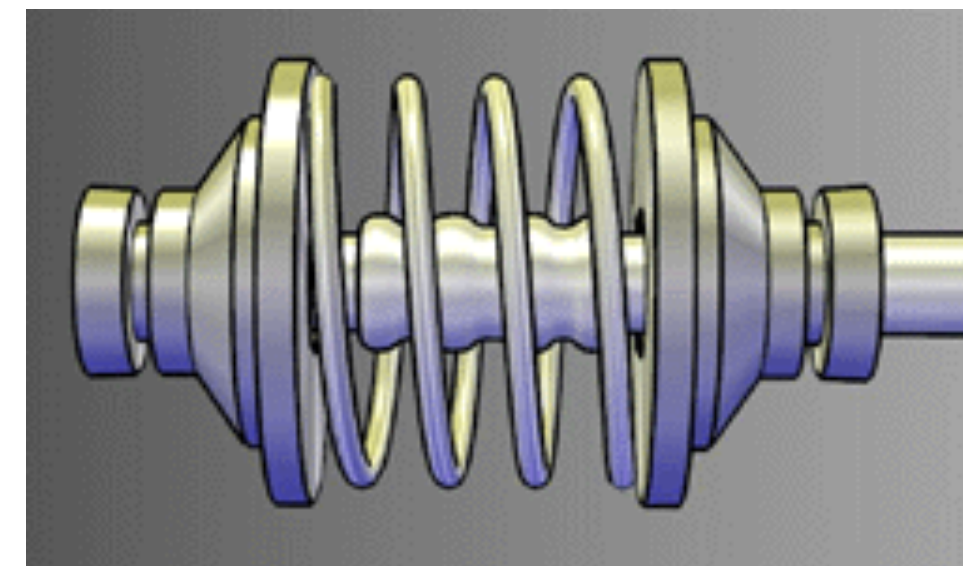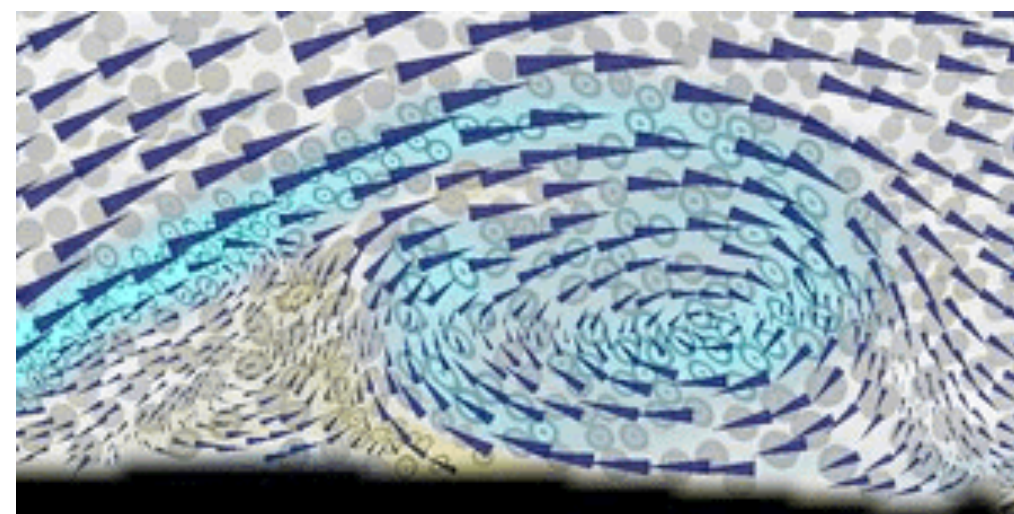
Nonphotorealistic Rendering

- 2D
  - Drawing packages
  - Layout (circuits, music)
  - Illustration
  - Painterly rendering
  - "Toon" generation

- 3D
  - Video games
  - Technical illustration

Visualization

3D Rendering

- If I took a picture of a scene with a virtual camera:

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  - What color is the light coming from that point as it reaches the camera?

Geometry

Lighting

Coming up...

- Camera basics (we'll come back to this more later)

- Perspective projection

- Simple modeling primitives (points, lines, polygons)

- 3D rendering geometry

- Introduction to OpenGL

- Hierarchical transformations

- Visibility

- Lighting

Labs 5–8

- Lab 5: 3D Geometric Rendering (with OpenGL)

- Lab 6: Hierarchical Transformations (with OpenGL)

- Lab 7: 3D Geometric Rendering (implement it yourself)

- Lab 8: Visibility, Lighting, and Shading (implement it yourself)