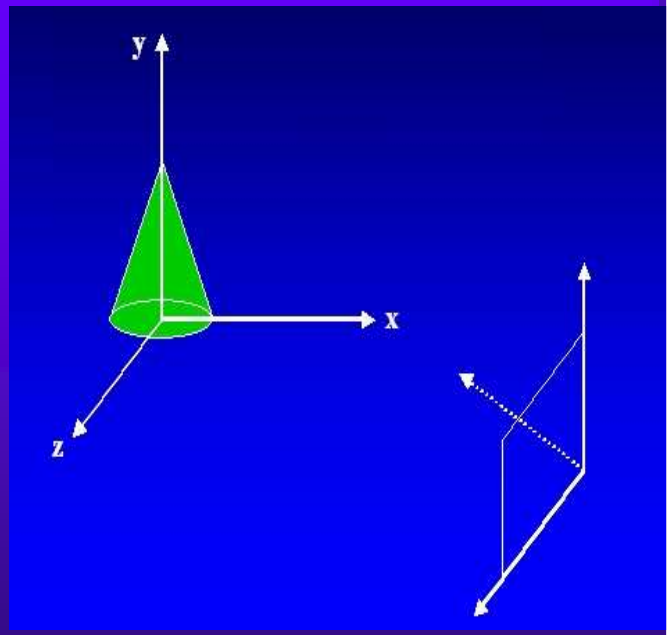
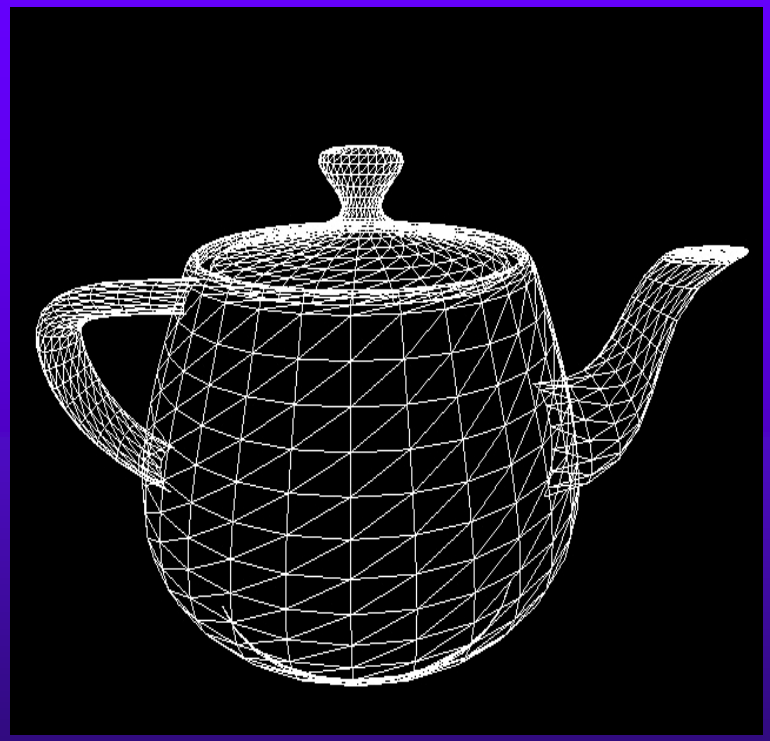
Three-Dimensional Concepts

Coordinate Reference

- To obtain a display of 3d scene that has been modeled in world coordinates ,set up a coordinate reference for the camera.
- This coordinate reference defines the position and orientation for the plane of the camera film.
- Object descriptions are transferred to the camera reference coordinates and projected onto the selected display plane.
- We can display the objects in wireframe form or we can apply lighting and surface rendering techniques to shade the visible surfaces.

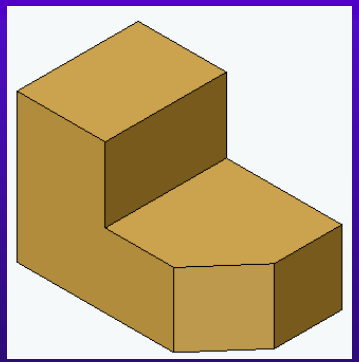


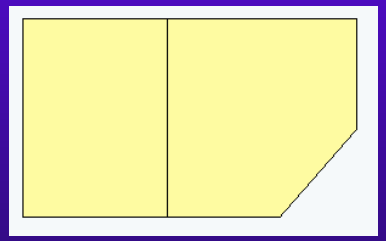
Wireframe

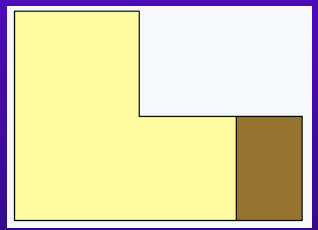


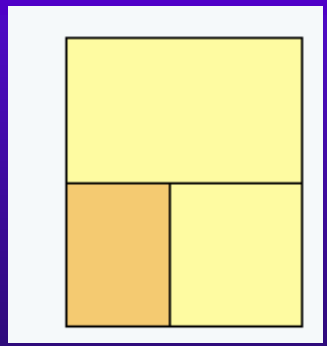
Three-Dimensional Display Methods
Parallel Projection

- Generates view of a solid object.
- Project visible points on the object surface along parallel lines onto the display plane to obtain 2d view.
- Parallel lines are still parallel after projection.



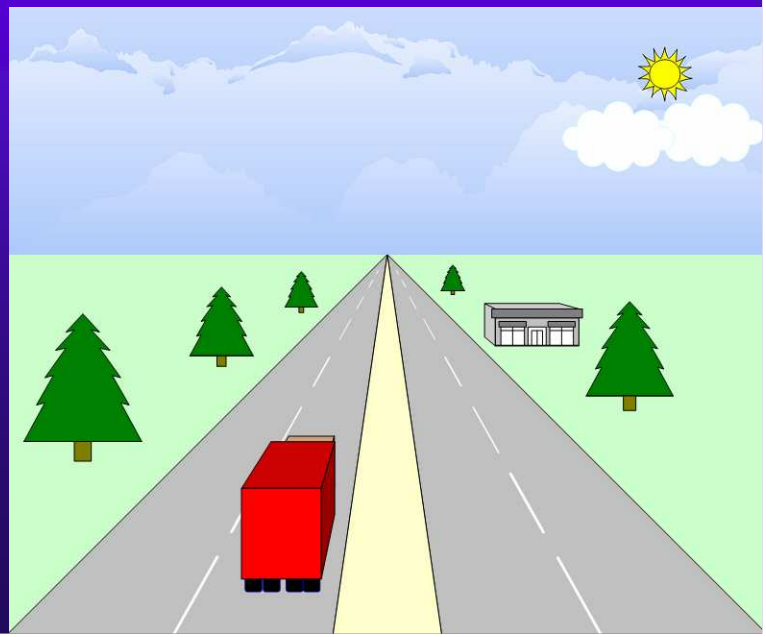






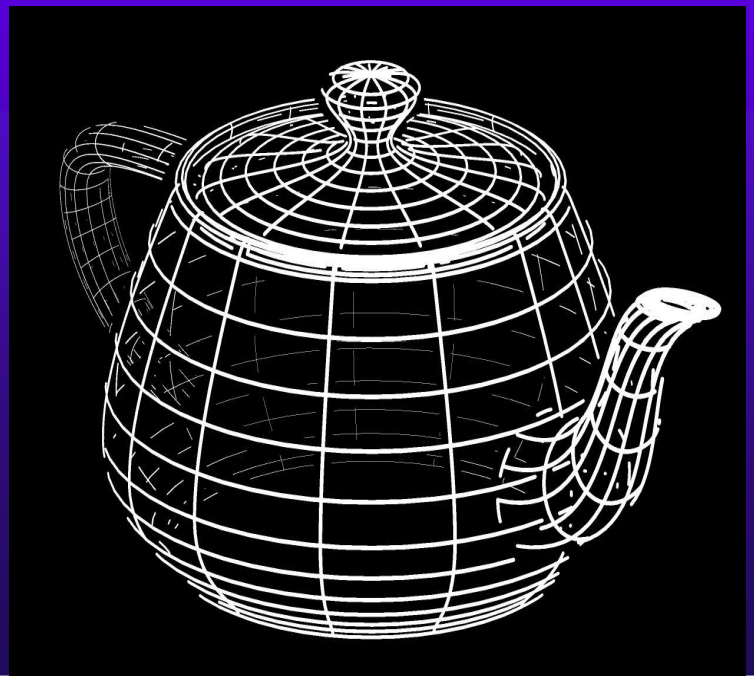
Perspective projection

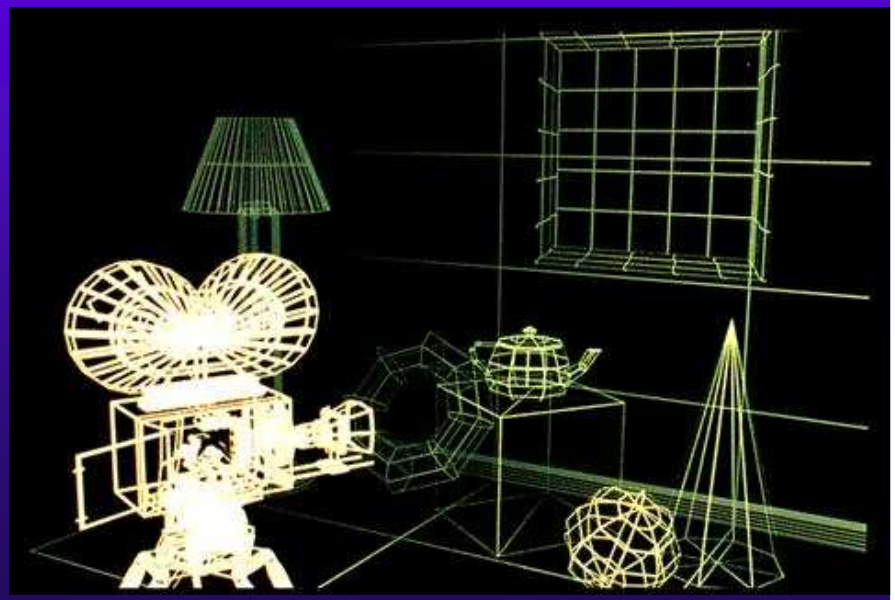
- Project points to the display plane along converging paths.
- This causes objects farther from the viewing position to be displayed smaller than the nearer objects.
- Parallel lines in a scene that are not parallel to the display plane are projected into converging lines.
- This is the way that our eyes and a camera lens form images.



Three-Dimensional Display Methods
Depth cueing

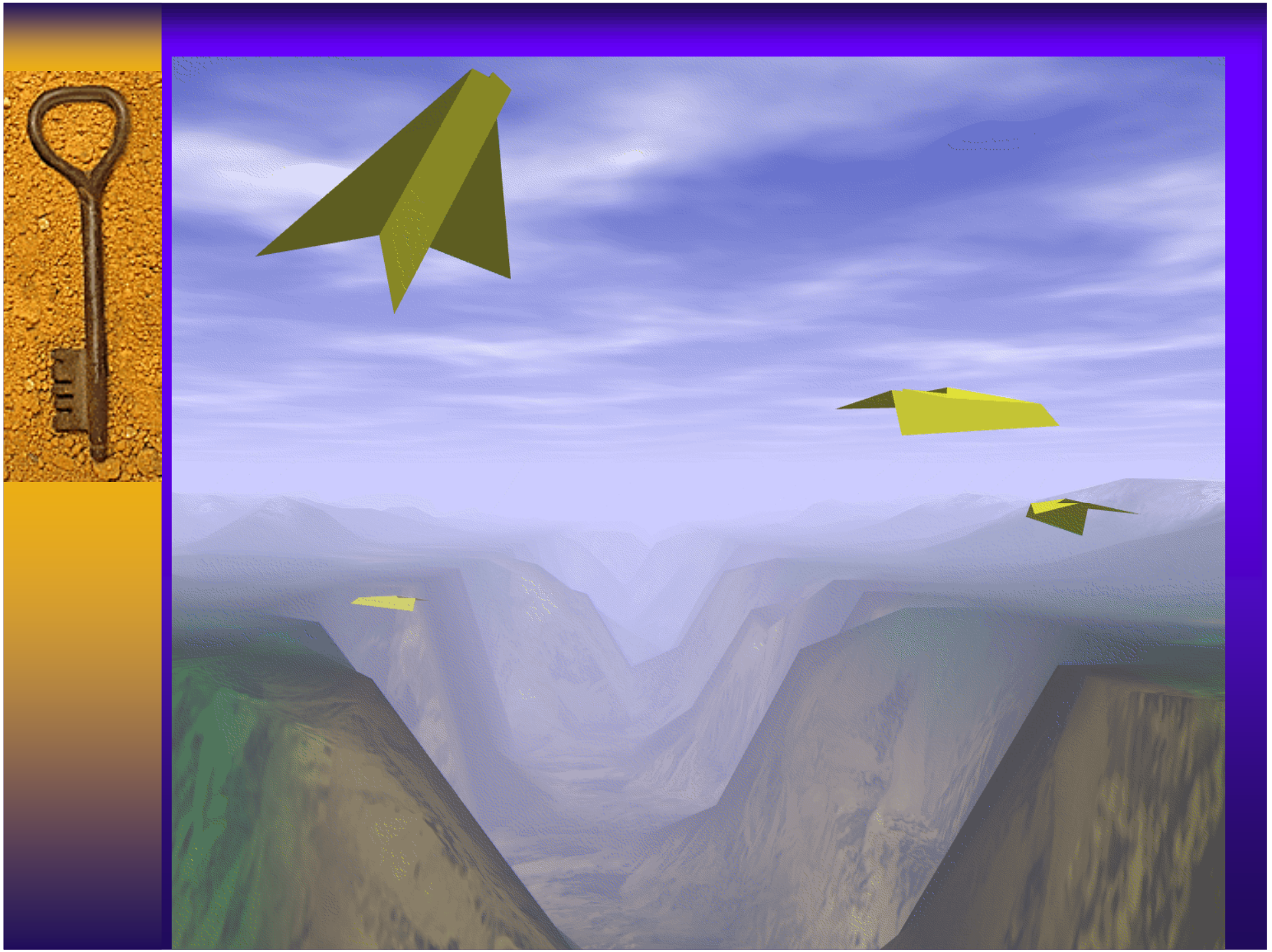
- Identify which is the front and which is the back of displayed objects
- For wireframe displays
  - Vary the intensity of objects according to their distance from viewing position
  - The line closest to the viewing position are displayed with the highest intensities than farther away





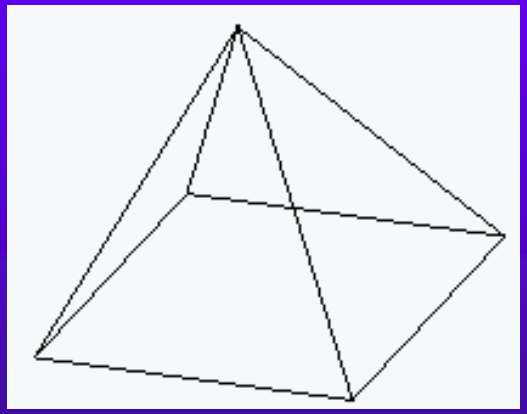
Three-Dimensional Display Methods Depth cueing

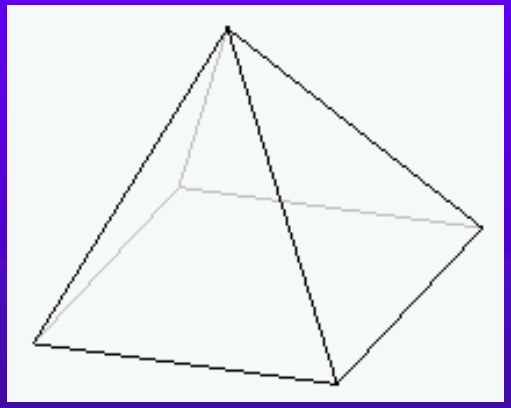
- Another application of depth cueing is modeling the effect of the atmosphere on the perceived intensity of objects.
- Distant objects appear dimmer to us than the nearer objects due to ,light scattering by dust particles, haze and smoke.
- Atmospheric effects can change the perceived color of an object and model.

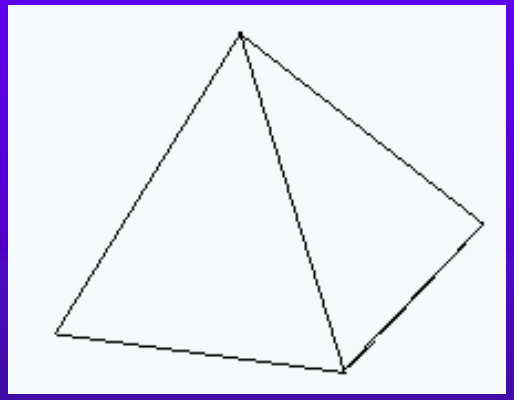


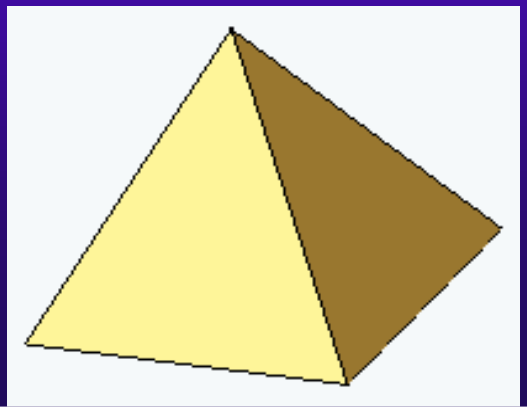
Three-Dimensional Display Methods
Visible line and surface identification

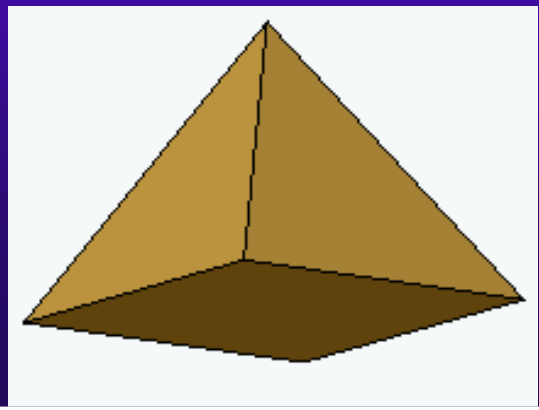
- Highlight the visible lines or display them in different color
- Display nonvisible lines as dashed lines
- Remove the nonvisible lines





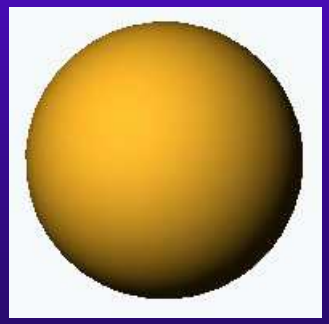


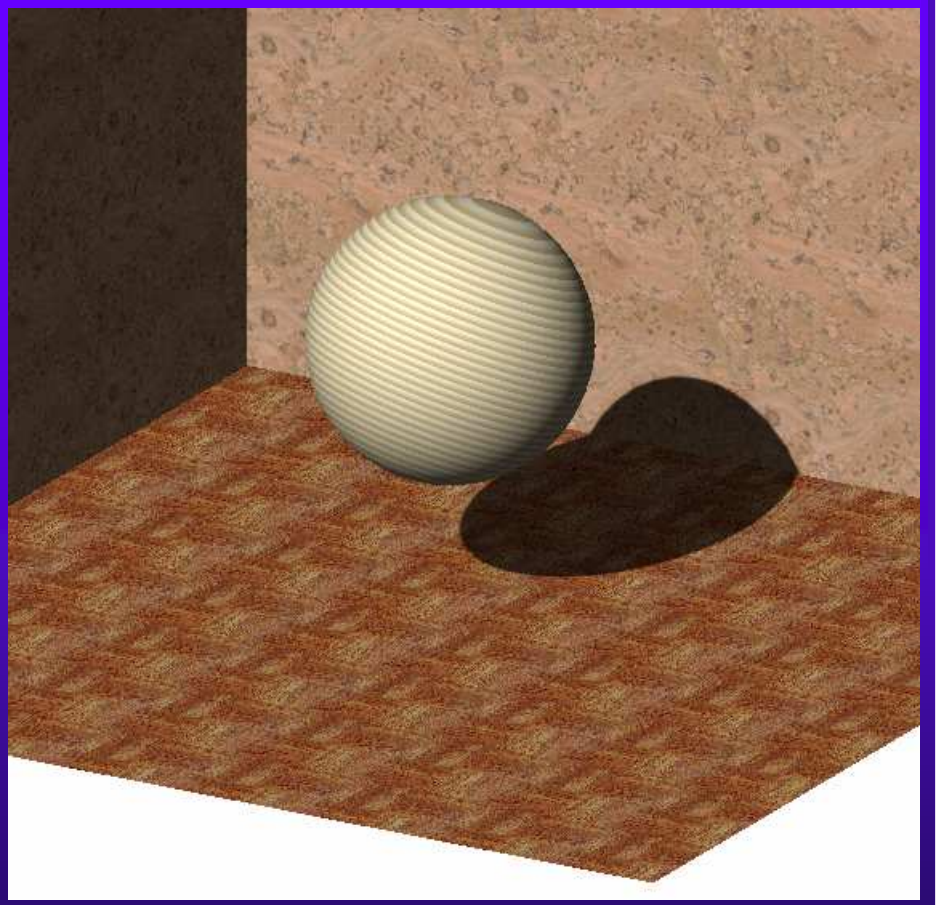




Three-Dimensional Display Methods
Surface Rendering

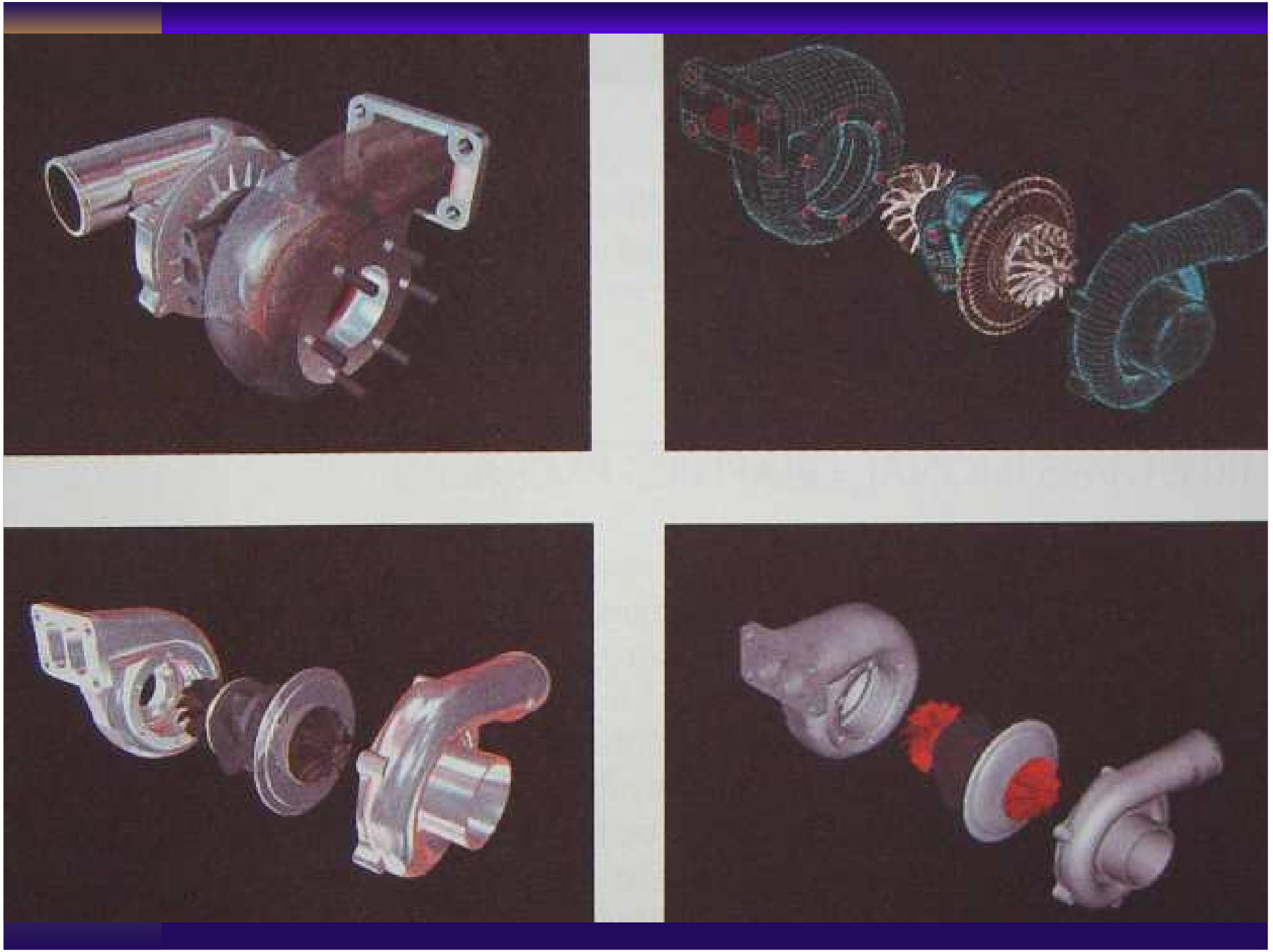
- Set the surface intensity of objects according to
  - Lighting conditions in the scene
  - Assigned surface characteristics





Three-Dimensional Display Methods

- Exploded view
  - Show the internal structure and relationship of the object parts



Three-Dimensional Display Methods

- Cutaway view
  - Remove part of the visible surfaces to show internal structure.