

# Animation Principles

# Animation Objectives

- Expressiveness
  - Artistic expression
  - Extremely hard to automate
- Realism
  - Hard to do by hand
  - Easier to automate, but we lose control

# Goals of expressive animation

Make characters move in convincing way to communicate personality and mood

- Walt Disney developed a number of principles
- Computer graphics animators have adapted them to 3D animation

# Animation principles

1. Squash and stretch
2. Staging
3. Timing
4. Anticipation
5. Follow through
6. Overlapping action
7. Secondary action
8. Straight-ahead vs. pose-to-pose vs. blocking
9. Slow in, slow out
10. Exaggeration
11. Appeal
12. Arcs
13. Weight

# Squash and stretch

**Squash:** flatten an object or character by pressure or by its own power

**Stretch:** used to increase the sense of speed and emphasize the squash by contrast

Note: keep volume constant

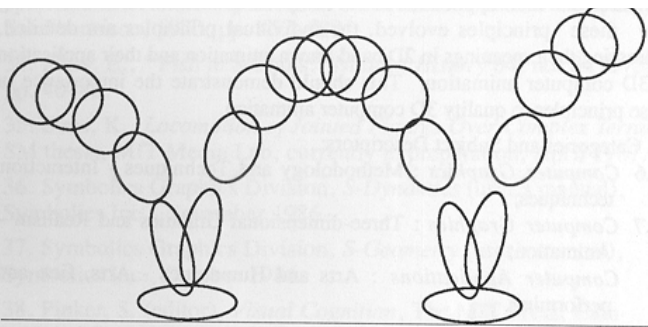


FIGURE 2. Squash & stretch in bouncing ball.

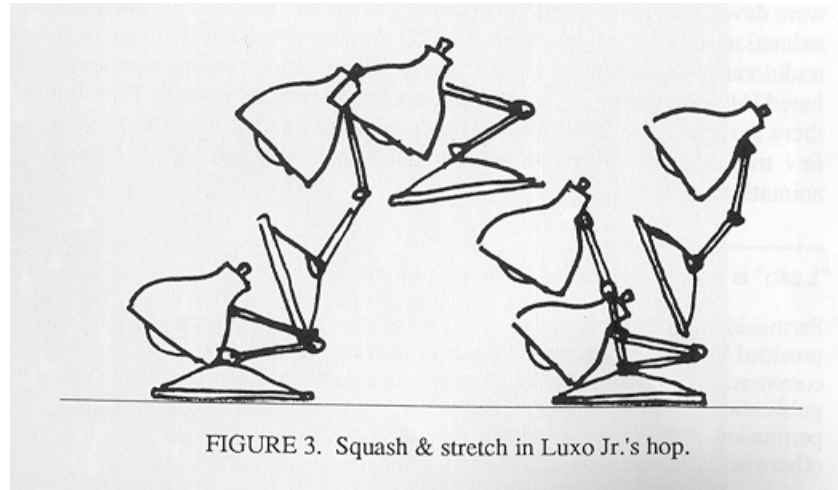
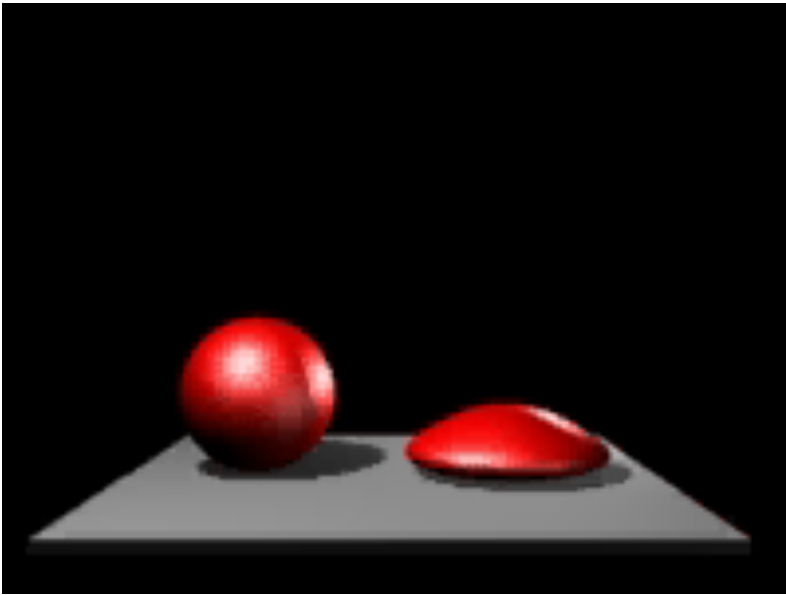


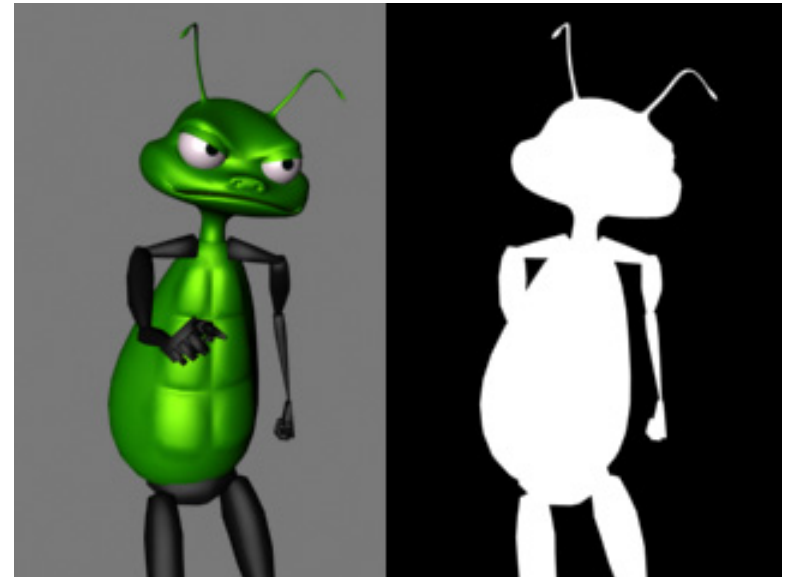
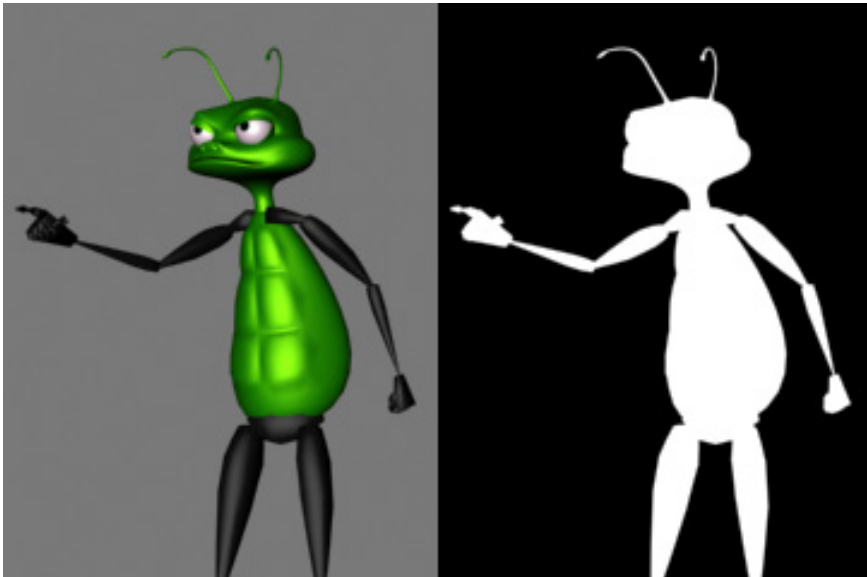
FIGURE 3. Squash & stretch in Luxo Jr.'s hop.

# Squash & stretch examples



# Staging

- Present the idea so it is unmistakably clear
- Audience can only see one thing at a time
- Useful guide: stage actions in silhouette
- In dialogue, character faces  $\frac{3}{4}$  towards the camera, not right at each other



# Timing

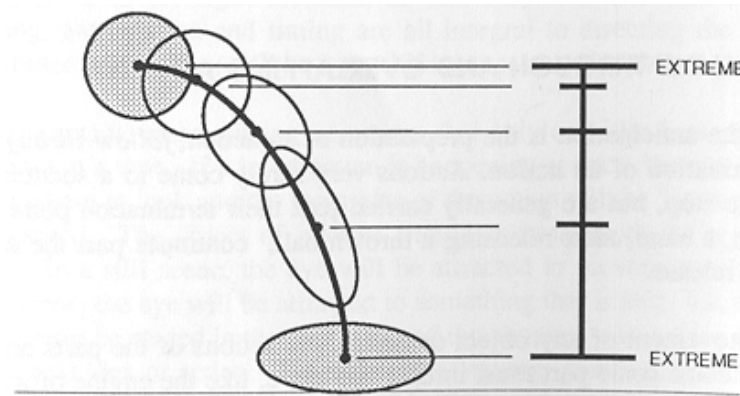


FIGURE 9. Timing chart for ball bounce.

- Timing affects weight:
  - Light object move quickly
  - Heavier objects move more slowly
- Timing can completely change the meaning of an action



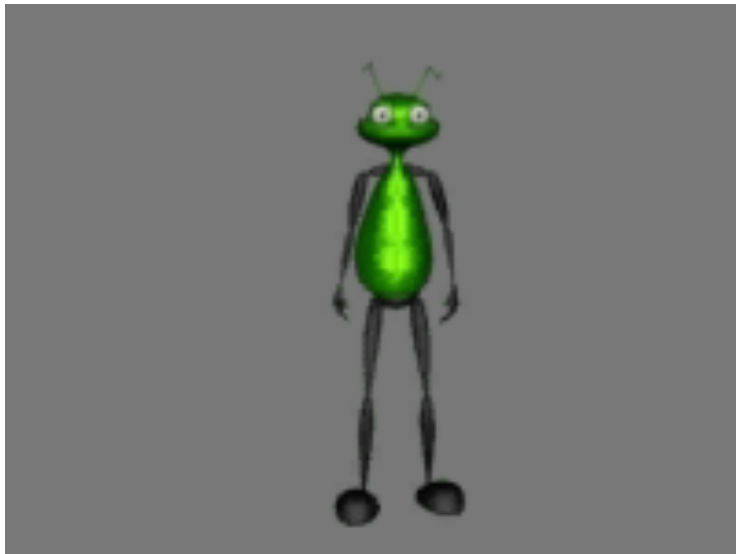
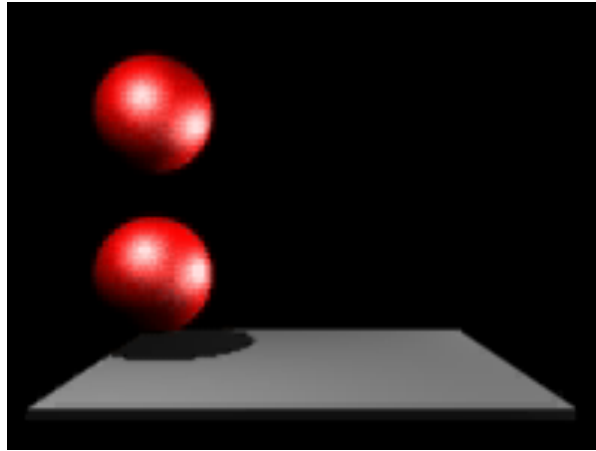
# Timing examples



# Anticipation

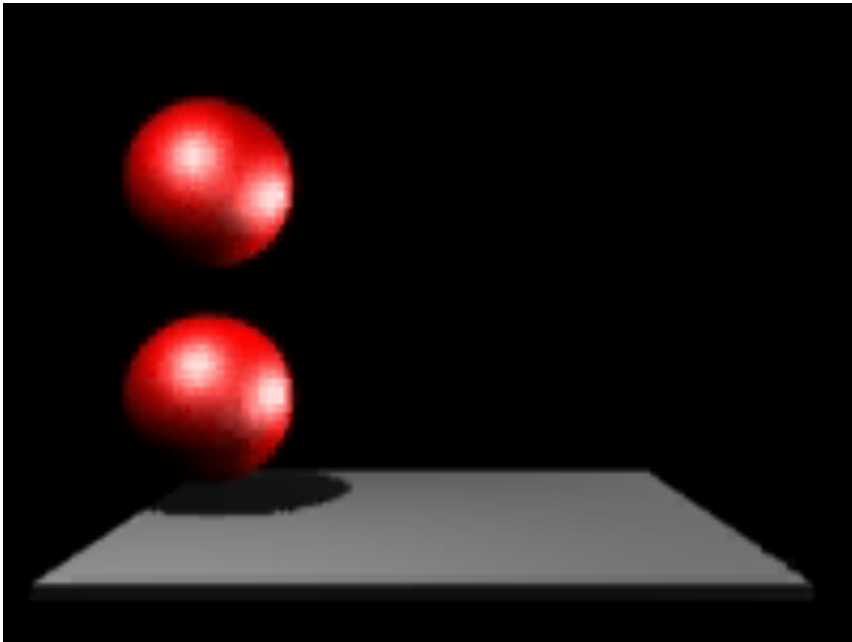
- An action breaks down into:
  - Anticipation
  - Action
  - Reaction
- Anatomical motivation: a muscle must extend before it can contract
- Prepares audience for action so they know what to expect
- Directs audience's attention
- Amount of anticipation can affect perception of speed and weight

# Anticipation examples



# Follow through

- Action seldom come to an abrupt stop
- Physical motivation: inertia



# Overlapping action

One part initiates (leads) the move. Others follow in turn.

- Hip leads legs, but eyes often lead the head.
- Loose parts move slower and drag behind.

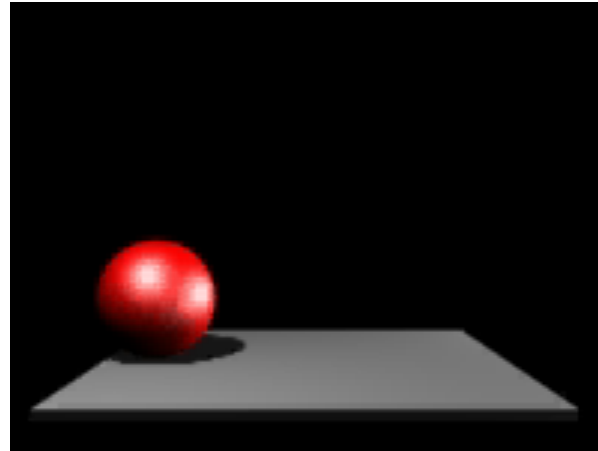
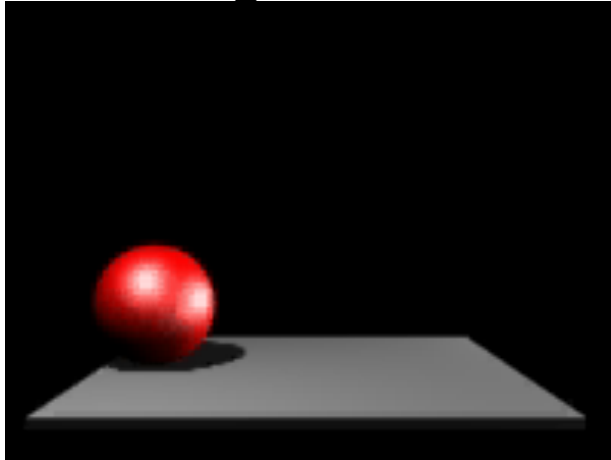
Overlaps apply to intentions. Example: settling into the house at night

- Close the door
- Lock the door
- Take off the coat

Each action doesn't come to a complete finish before the next starts

# Arcs

Avoid straight lines since most things in nature move in arcs



# Secondary action

An action that emphasizes the main point, but is secondary to it.



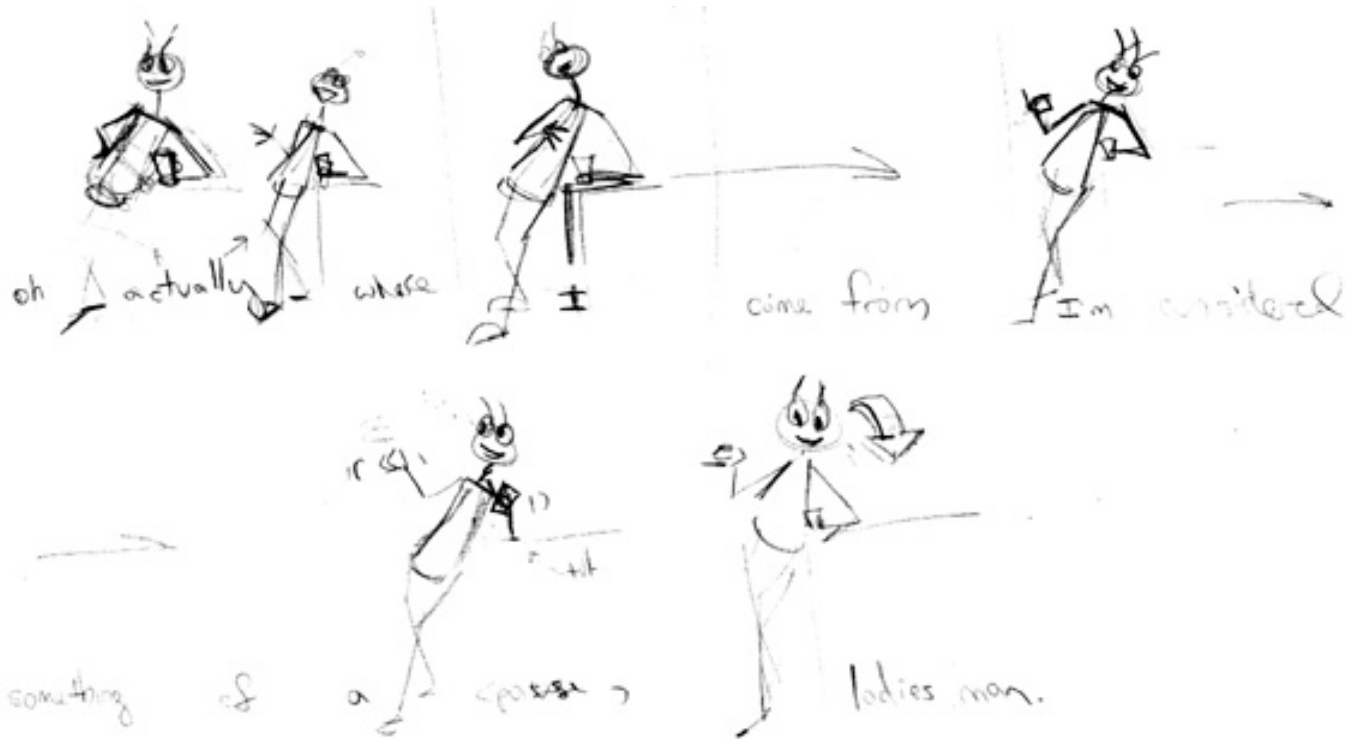
FIGURE 5. Wally B.'s zip off shows use of squash and stretch, anticipation, follow through, overlapping action, and secondary action.

# Straight-ahead vs. pose-to-pose vs. blocking

- Straight ahead: proceed from frame to frame without planning where you want to be in ten frames. Can be wild, spontaneous.
- Pose-to-pose: Define keyframes and “inbetweens”.
- Blocking: computer graphics animators adaptation:
  - Start key – framing at the top of the hierarchy
  - Refine level by level
  - Keyframes for different parts need not happen at the same time.



# Pose to pose

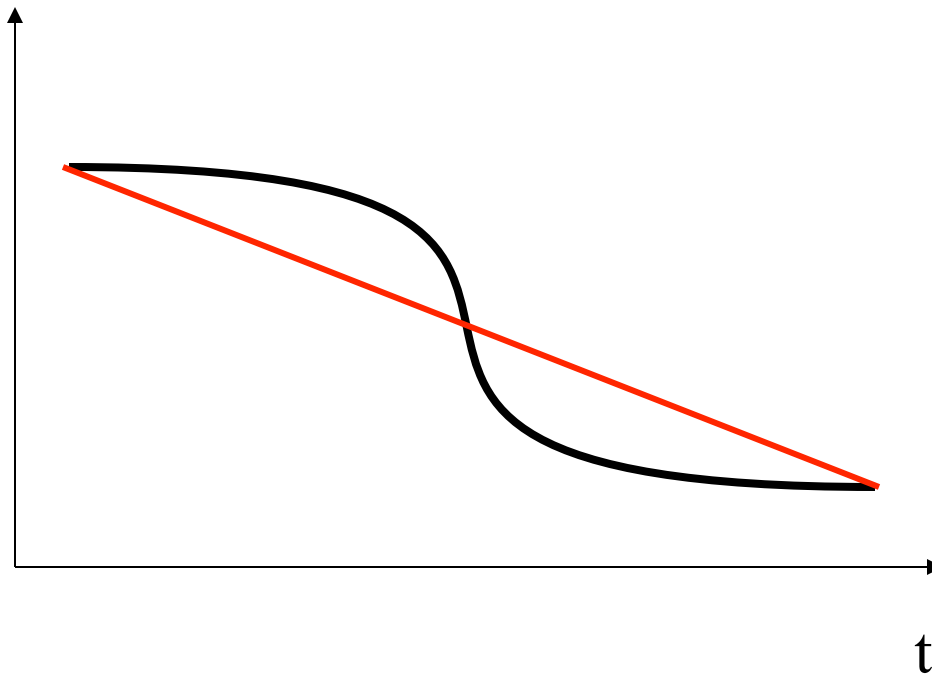


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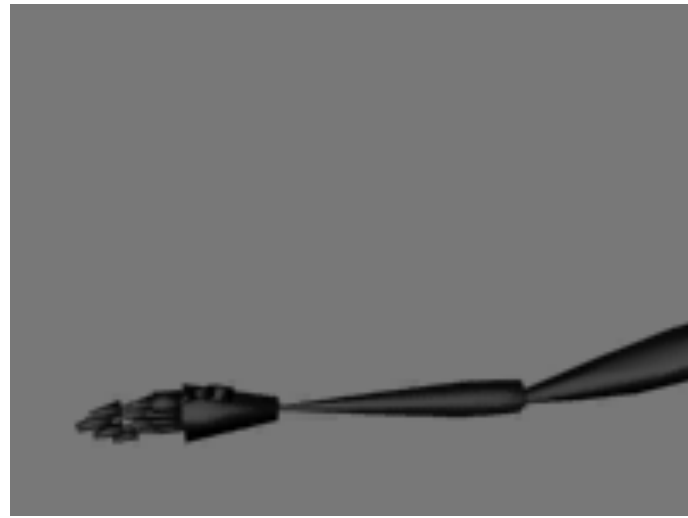
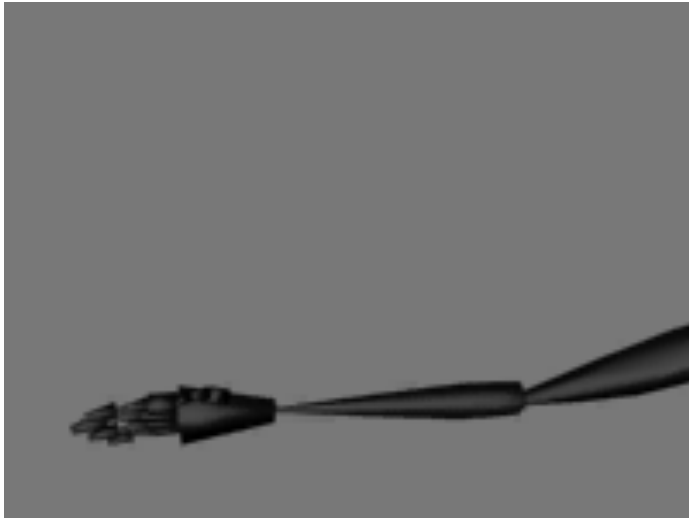
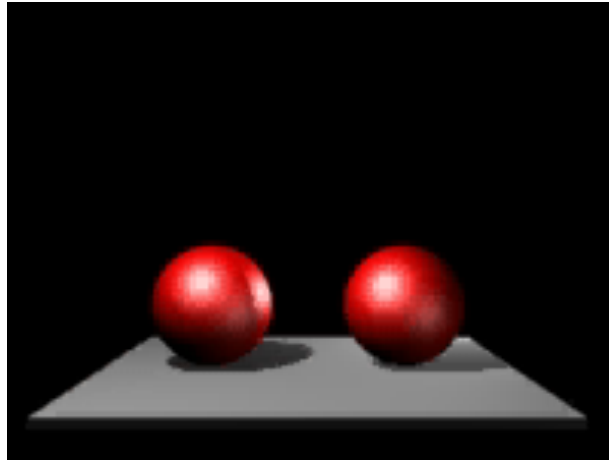
[www.comet-cartoons.com](http://www.comet-cartoons.com)

# Slow in, slow out

- An extreme pose can be emphasized by slowing down as you get to it (and as you leave it)



# Slow in, slow out examples



# Exaggeration

Get to the heart of the idea and emphasize it so the audience can see it.

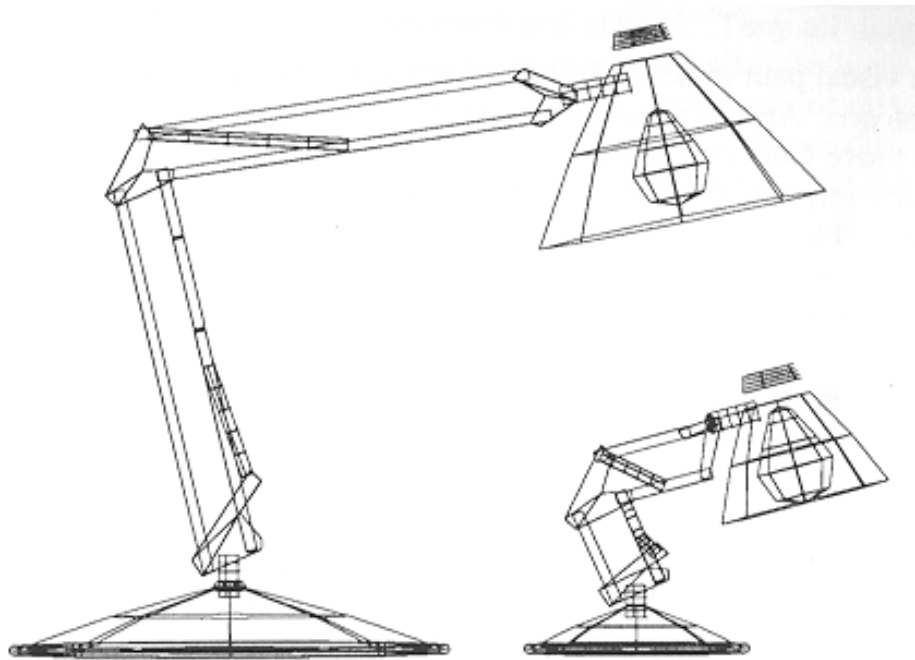
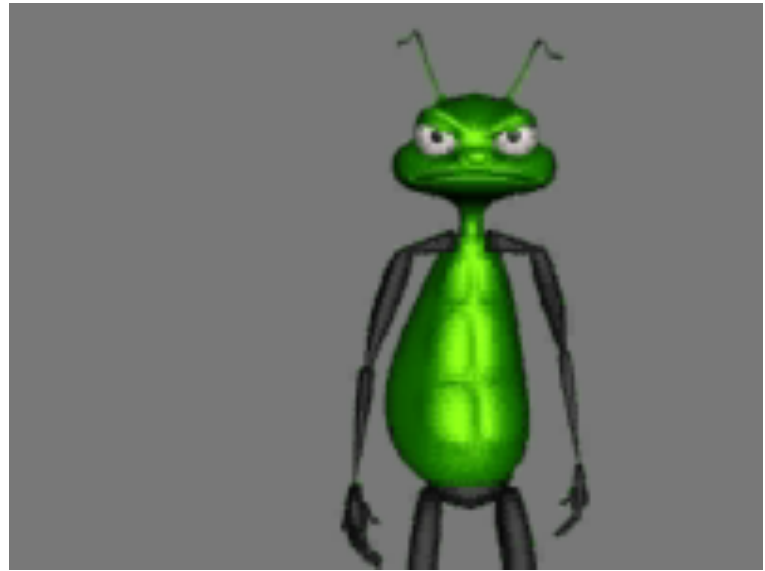


FIGURE 11. Varying the scale of different parts of Dad created the child-like proportions of Luxo Jr.

# Exaggeration examples



# Appeal

- The character must interest the viewer.
- It doesn't have to be cute and cuddly
- Design, simplicity, behavior all affect appeal.
- Note: avoid perfect symmetries
- E.g.: Luxo Jr. is made to appear childlike

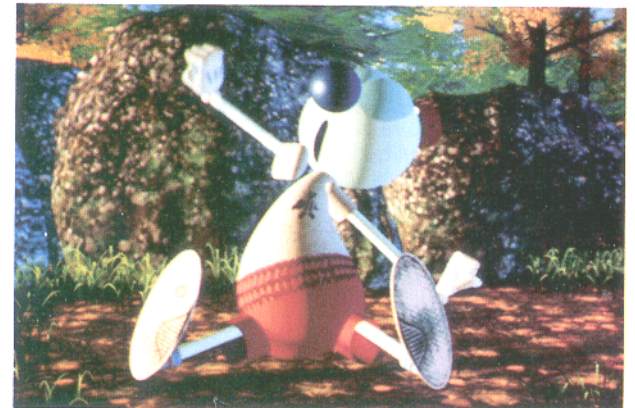
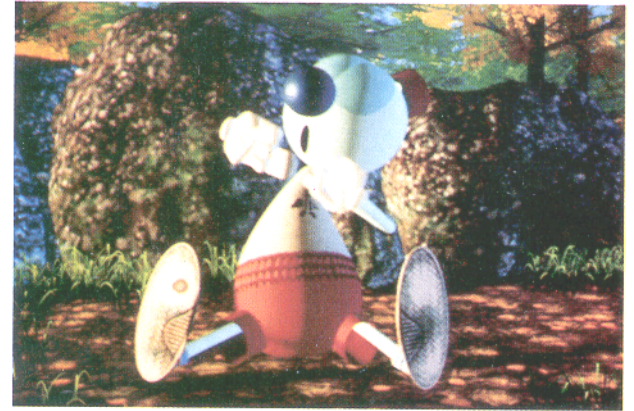
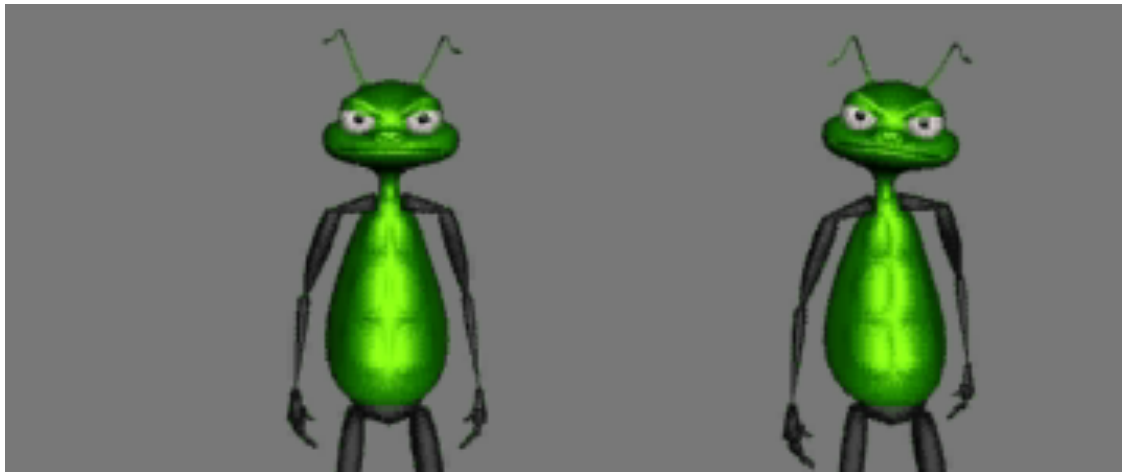
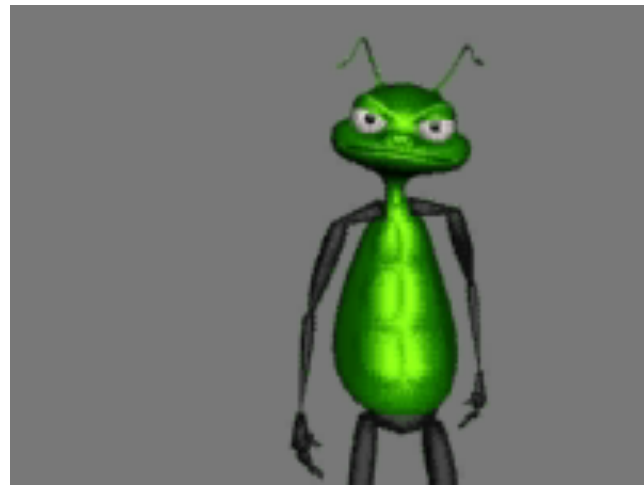
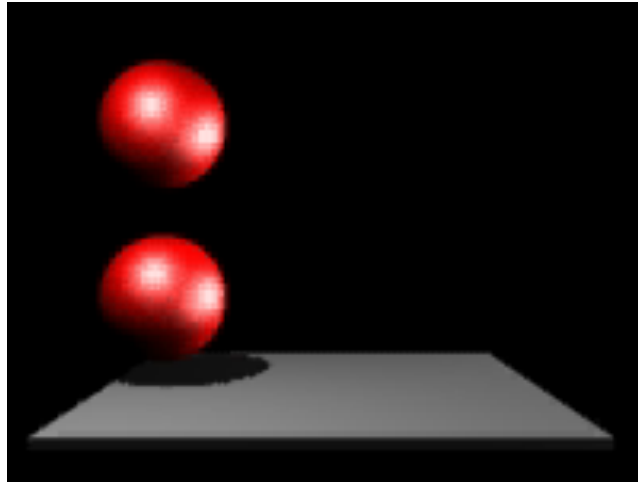


FIGURE 12. Andre's yawn was made more interesting by not duplicating the poses and the action from one side of his body to the other.

# Snap



# Weight

Combination of Timing, Slow in/out, Arcs, Anticipation, Exaggeration, Squash&Stretch, Secondary motion, Follow Thru/Overlap, and Staging

