Animation principles

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Adapted from Brian Curless
CSE 457
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Reading

Required:

- John Lasseter. Principles of traditional animation applied to 3D computer animation. Proceedings of SIGGRAPH (Computer Graphics) 21(4): 35-44, July 1987.

Recommended:

- Frank Thomas and Ollie Johnston, Disney animation: The Illusion of Life, Hyperion, 1981.
- Michael Comet tutorial (source for the ball and green bug examples in this lecture):
  http://www.comet-cartoons.com/3ddocs/charanim/index.html

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Character animation

Goal: make characters that move in a convincing way to communicate personality and mood.

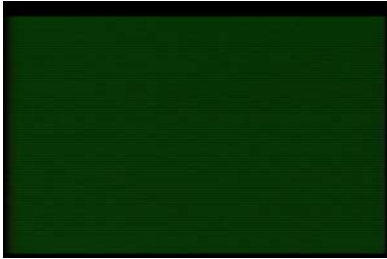Walt Disney developed a number of principles.

Computer graphics animators have adapted them to 3D animation.

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Andre and Wally B.

Luxo Jr.

Animation Principles

6. Overlapping action
7. Secondary action
8. Straight-ahead vs. pose-to-pose vs. blocking
9. Arcs
10. Slow in, slow out
11. Exaggeration
12. Appeal

We will consider each...

: flatten an object or character by pressure or by its own power.

: used to increase the sense of speed and emphasize the squash by contrast.
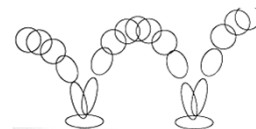
Note: keep volume constant!
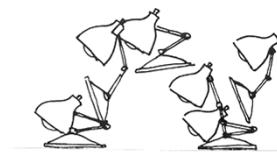

FIGURE 2. Squash & stretch in bouncing ball.

FIGURE 3. Squash & stretch in Luxo Jr.'s hop.
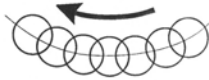
[Lasseter]
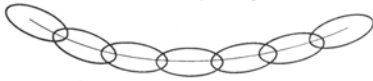
Squash and stretch (cont'd)

[Lasseter]

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Squash and stretch (cont'd)

[Thomas and Johnston]

10

Squash and stretch (cont'd)

[Thomas and Johnston]

11

Squash and stretch (cont'd)
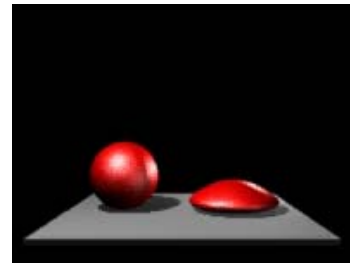
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Staging

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, characters face 3/4 towards the camera, not right at each other.

Timing

action, and the reaction. Don't dwell too long on any of these.

Timing also reflects the weight of an object:

- light objects move quickly
- heavier objects move more slowly

Timing can completely change the meaning of an action.

Timing (cont'd)

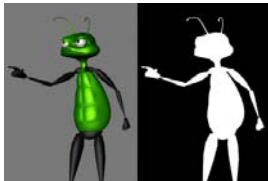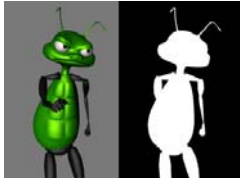**The many meanings of a simple head turn:**

NO inbetweens	hit by a tremendous force.
ONE inbetween	hit by a brick, frying pan.
TWO inbetweens	nervous tic, muscle spasm.
THREE inbetweens	dodging a thrown brick.
FOUR inbetweens	giving a crisp order (move it!)
FIVE inbetweens	a more friendly order (c'mon!)
SIX inbetweens	sees a sportscar he always wanted
SEVEN inbetweens	trying to get a better look...
EIGHT inbetweens	searching for something on shelf
NINE inbetweens	considering thoughtfully
TEN inbetweens	stretching a sore muscle

[Thomas and Johnston]

Timing (cont'd)
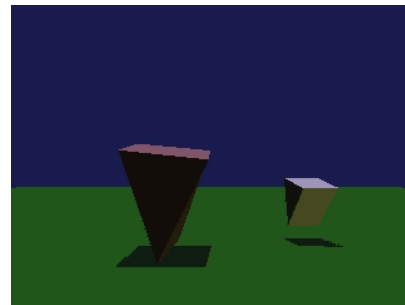
Animation by Ken Perlin.

Anticipation

An action has three parts: 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.

Anticipation (cont'd)

Amount of anticipation (combined with timing) can affect perception of speed or weight.

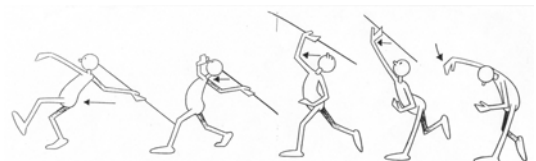UGLIFYING ACID

REDUCING OIL

VANISHING FLUID

Follow through

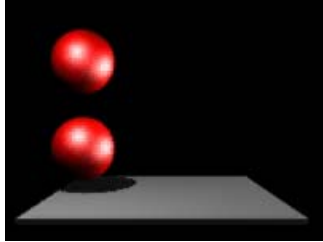Actions seldom come to an abrupt stop.

Physical motivation: inertia

Follow through (cont'd)

Overlapping action

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

Hip leads legs, but eyes often lead the head.

Loose parts move slower and drag behind (sometimes called "secondary motion").

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

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

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

The Wrong Trousers

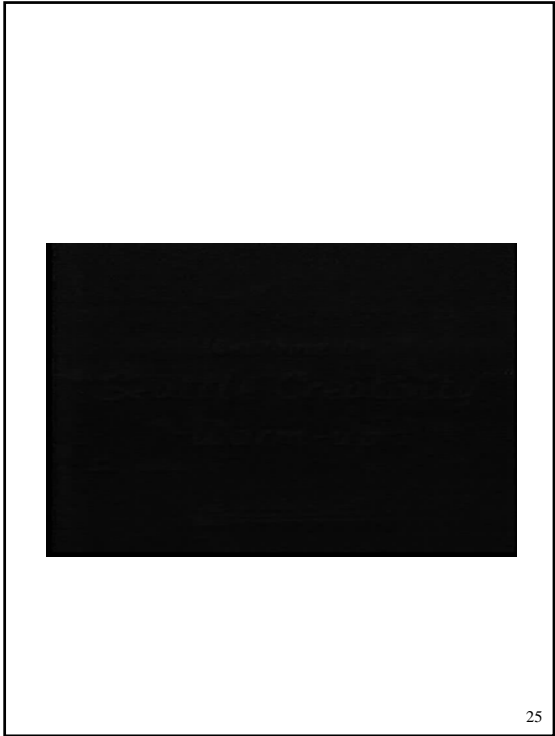## Jurassic Park

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Secondary action

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

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

pose: Define keyframes and "inbetweens".

Blocking: Computer graphics animators adaptation
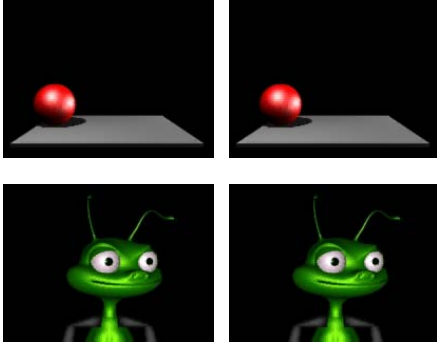
- ◆ Start key-framing at the top of the hierarchy.
- ◆ Refine level by level.
- ◆ Keyframes for different parts need not happen at the same time.

Straight-ahead vs.
pose-to-pose vs. blocking (cont'd)

Screenshot from Maya

Arcs

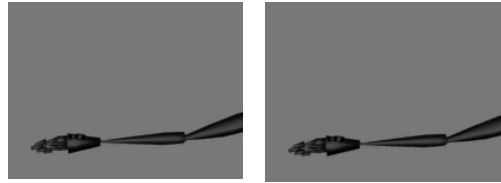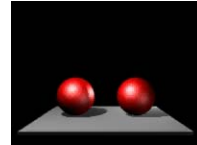Avoid straight lines since most things in nature move in arcs.

Slow in and slow out

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

In practice, many things do not move abruptly but start and stop gradually.

Exaggeration

Appeal

The character must interest the viewer.

It doesn't have to be cute and cuddly.

Design, simplicity, behavior all affect appeal.

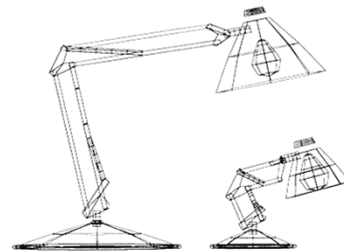Example: Luxo, Jr. is made to appear childlike.

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

[Lasseter]

Appeal (cont'd)

Note: avoid perfect symmetries.

[Thomas and Johnston]

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Appeal (cont'd)

Note: avoid perfect symmetries.

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Animation artifact

Animation artifact

- ◆ *One artifact per group*
- ◆   *60 seconds*…shorter is usually better. Don't make an animation that feels like "slow motion"!
- ◆ *Snapshot*   *5pm Thursday, December 8*
  - · Nothing fancy, just something that will help people remember which artifact was yours during voting.
- ◆ *Artifact*   *10am Friday, December 9*
- ◆

Artifact voting

- ◆
- ◆
- ◆   "Up" DVD
- ◆ 1st place: "Up" DVD + mystery prize!

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Animation production

More broadly animation is about making "movies" and encompasses:

- ◆ **Story**
- ◆ **Art design**
- ◆ **Modeling**
- ◆ **Cinematography**
- ◆ **Motion**
- ◆ **Rendering**

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Bug's Life: Storyboards

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Bug's Life: Modeling, Layout

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Bug's Life: Animation

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Bug's Life: Shaders and Lighting

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