



Visual learning: How much do we learn from what we see?

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Seeing is believing

*“Visual observations greatly help
the understanding of material”*

1 = disagree, 5 = agree

Visualization is important

*“Memories of observations reinforce
the retention of physical models”*

1 = disagree, 5 = agree

1 picture = 1000 words

*“Information can be transferred more quickly
and more effectively visually than verbally”*

1 = disagree, 5 = agree

Message

There is much to learn from
cognitive and developmental psychology

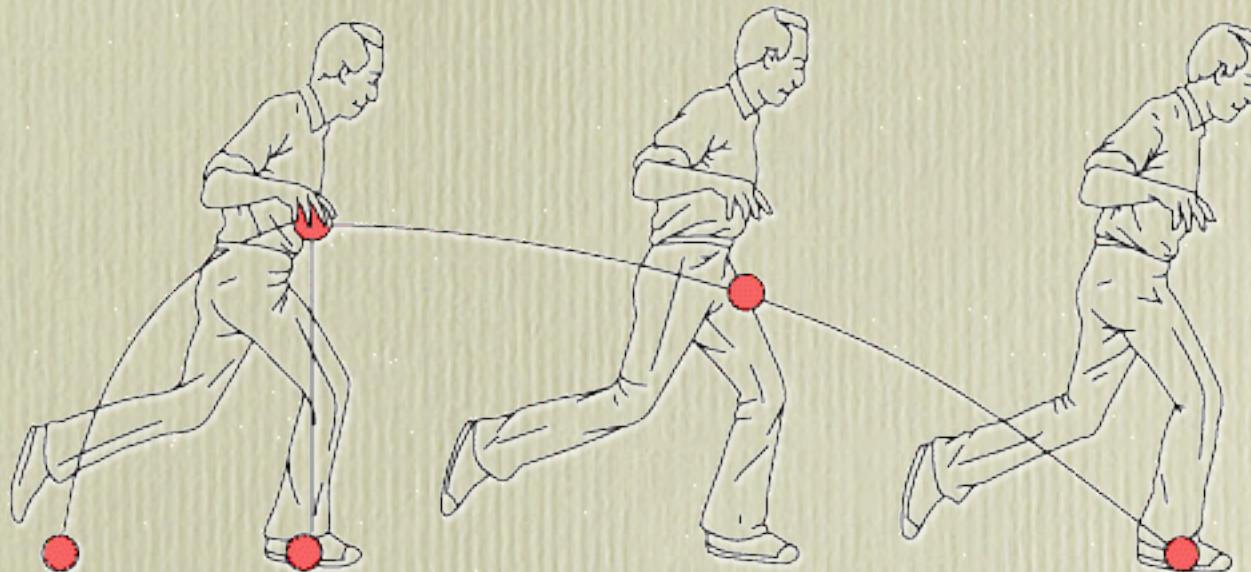
Mental models

of behavior, events, workings are essential to

- understand our experiences
- predict outcomes of our actions
- handle unexpected occurrences

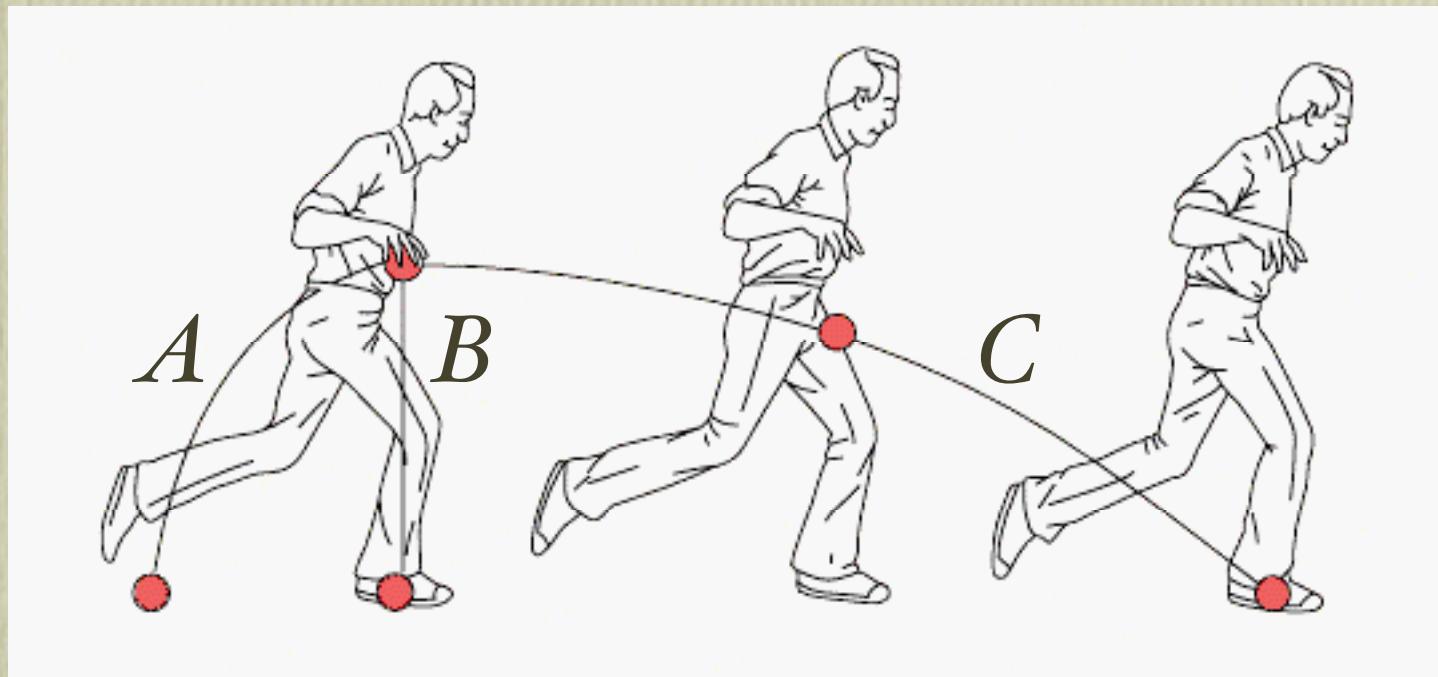
Parabolic motion

A quick quiz



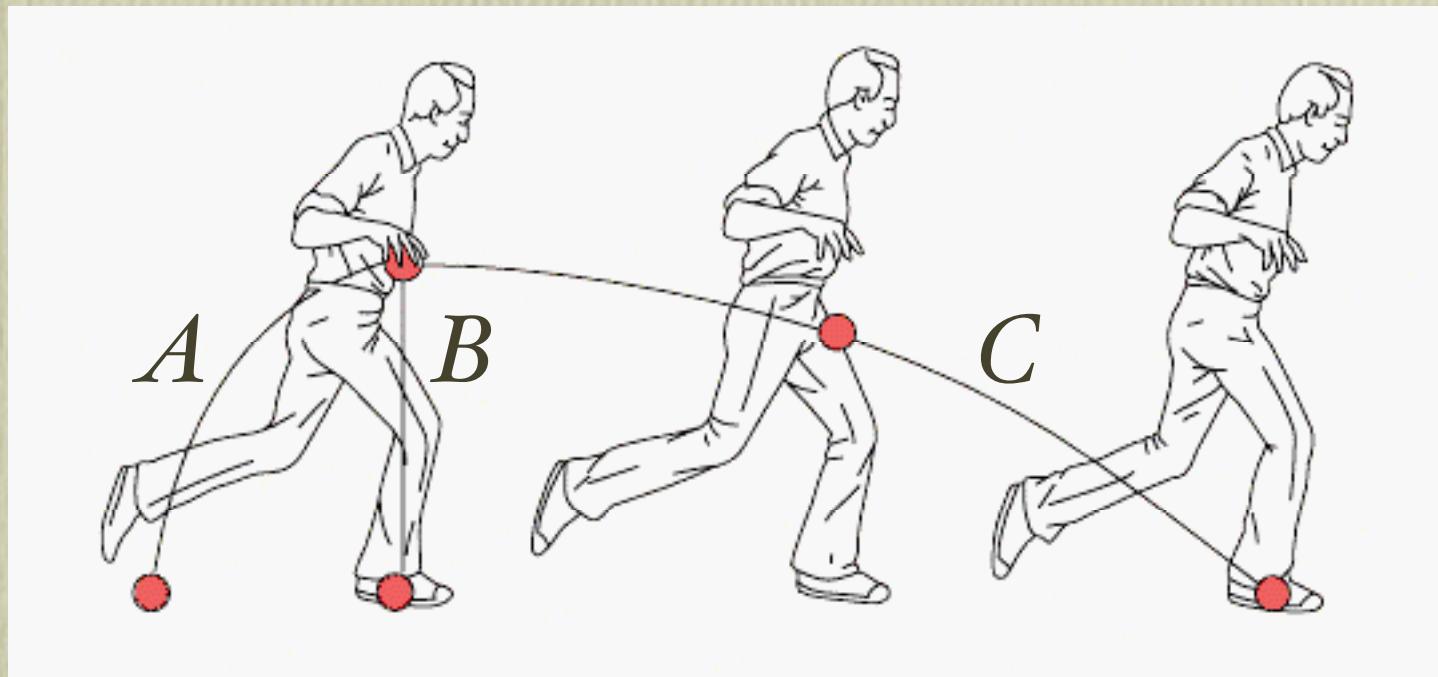
M. McCloskey, *Intuitive Physics*
Scientific American 248 (1983), pp. 122-130

A quick quiz



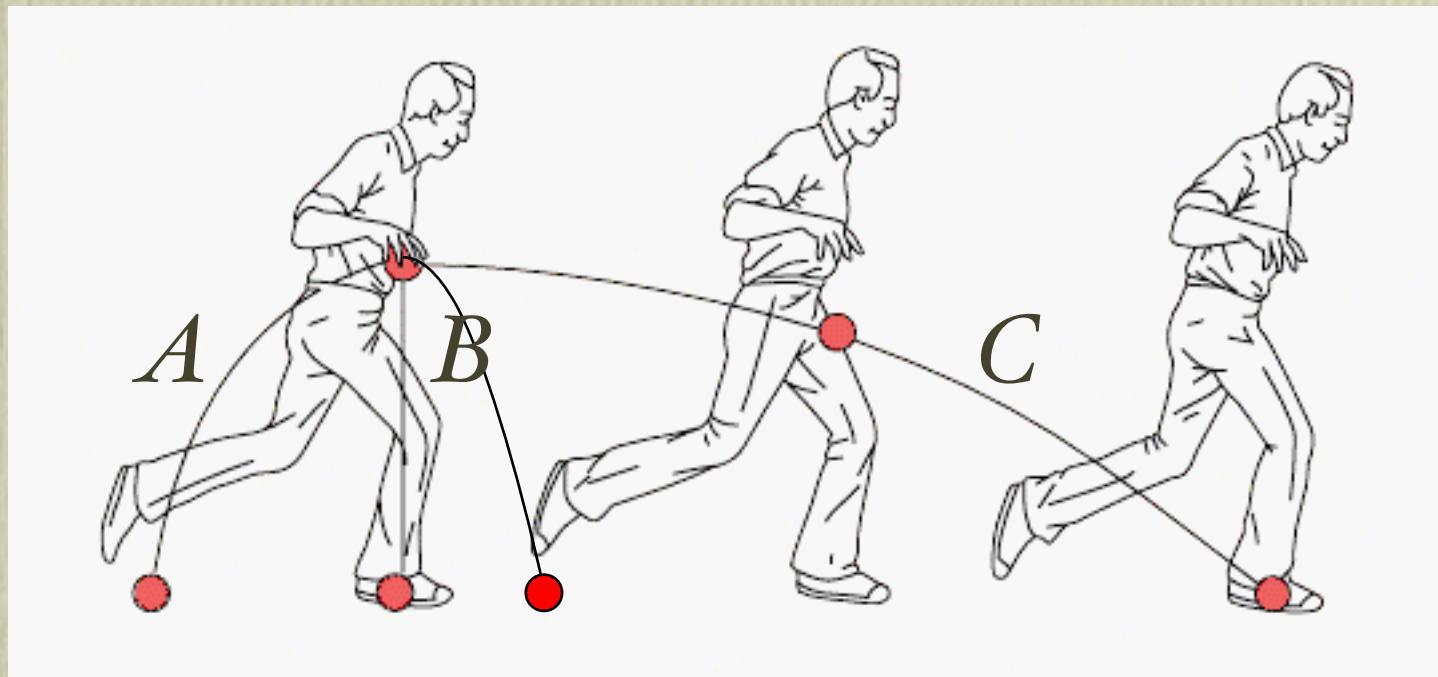
Which of the three paths shown (*A*–*C*) most closely resembles the path taken by the ball?

A quick quiz



Answer: *B*

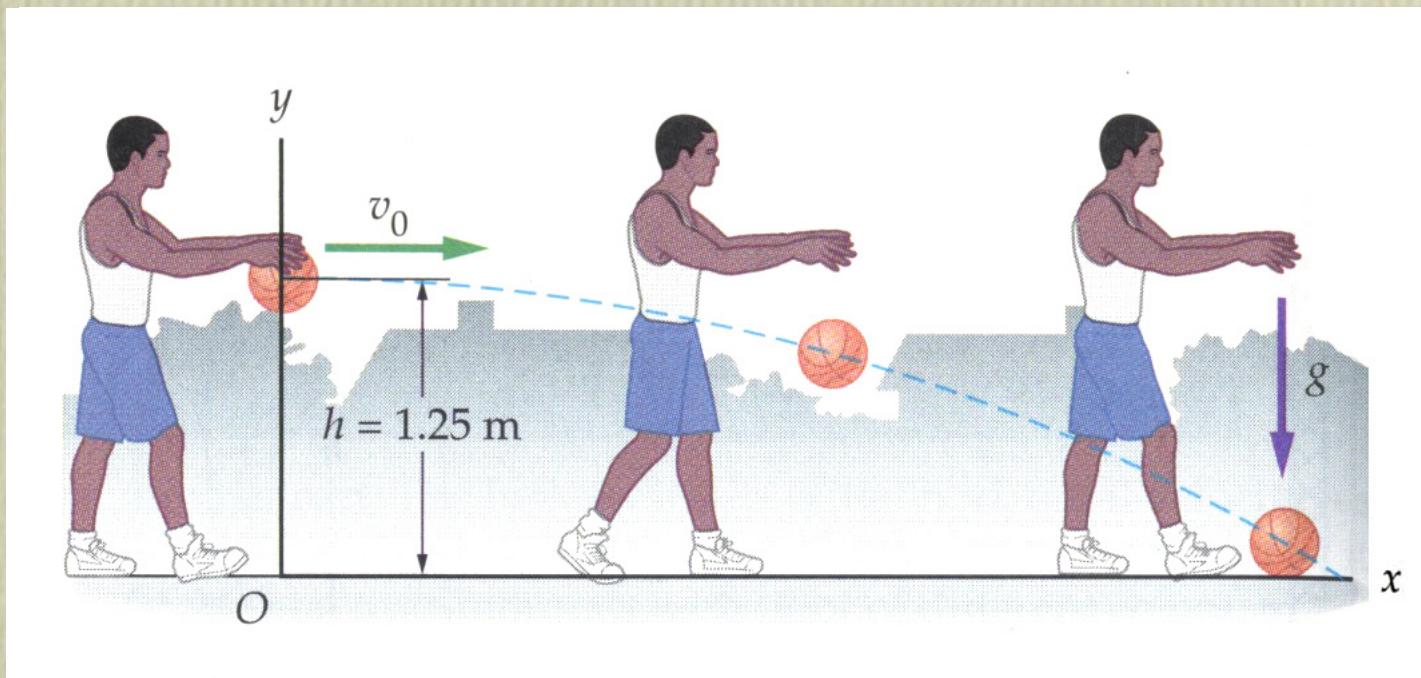
A quick quiz



Answer: *B*

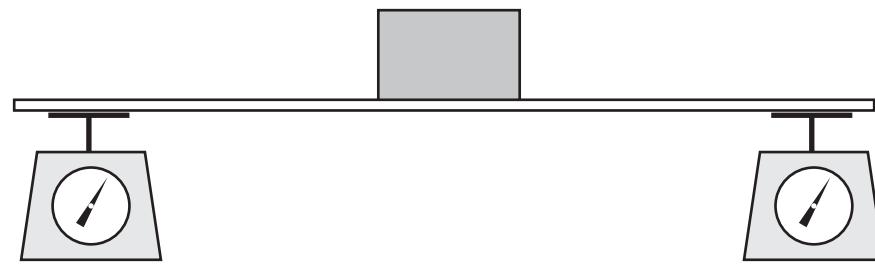
Even text book authors get the physics wrong!

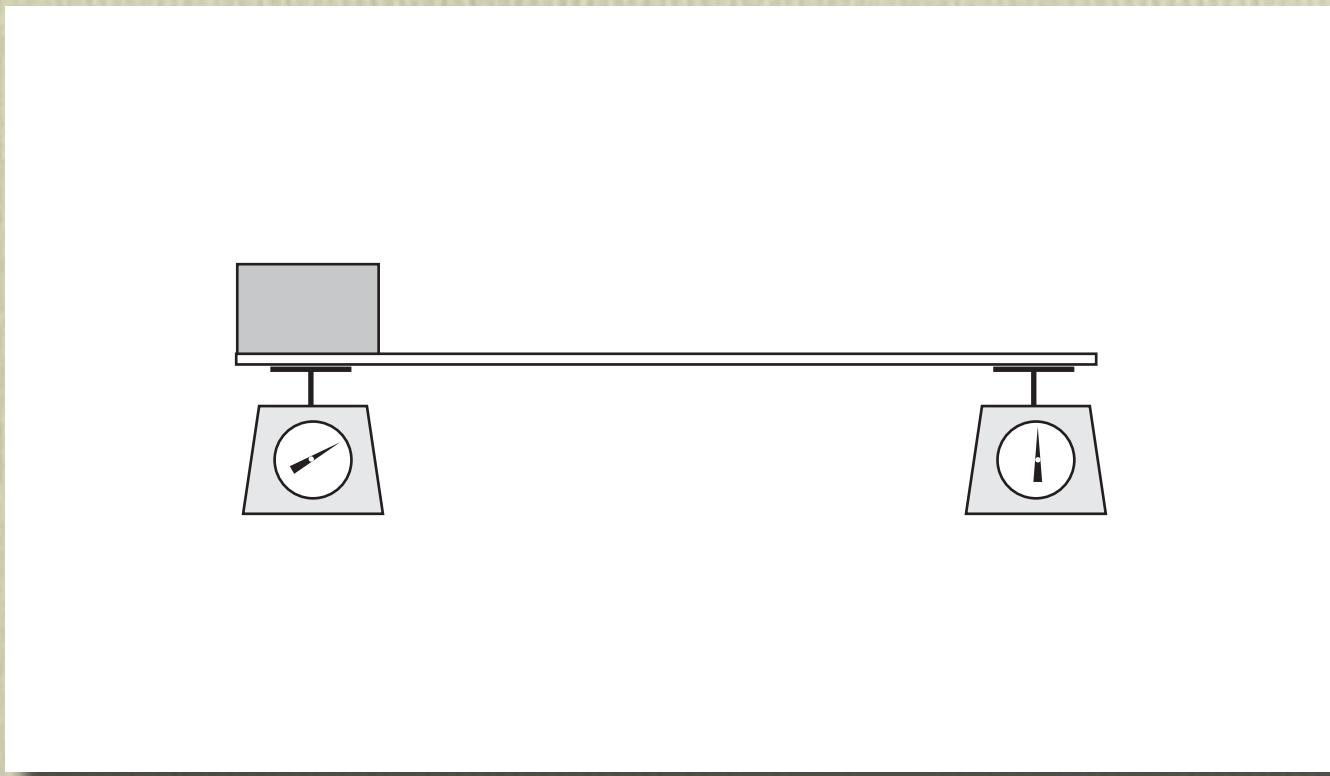
Microgravity



Walker, 2nd Ed. (Prentice Hall, 2004)

Mental models override visual memory





Common misconception

Plank evens out the load,
so scale reading doesn't change

Can we correct this misconception
by showing the demonstration to students?

Presenting ineffective

“As demonstrated in lecture both scales will read 10 N regardless of where the center of mass is located. The platform and the metal block form one unit that is being measured, so the scales show two evenly distributed readings, no matter where the metal block is placed along the platform.”

Observation can *reinforce* misconception!



Must provide opportunity to revise model

How?

- Predict outcome before observation
- Record observation
- Reconcile prediction with observation

Child development

Stages of cognitive development of the child
are elements of our own cognitive process

Jean Piaget

“The inner image we remember from a process is not the result of our perception of the same thing or process.”

The psychology of the child (1966)

Two kinds of images

Reproduced: recall of perceived image

Anticipated: visualize change/motion and anticipate outcome independent of direct perception

Piaget's conclusion

“The reproduction of change and transformation requires the skill to anticipate. Anticipation is impossible without the corresponding active cognitive operation.”

Points to keep in mind

- Mental models affect what we see
- Mental tasks can prevent us from seeing
- Mental models override visual memory

Conclusions

- Learning involves revising ideas
- Seeing a picture/demonstration insufficient
- Active participation required

Acknowledgments

Dr. Paul Callan

Dr. Catherine Crouch

for a copy of this presentation see:

<http://mazur-www.harvard.edu>