

Università degli Studi di Palermo
Facoltà di SS.MM.FF

Classe 23/S

Lauree Specialistiche in Informatica

**Dottorato “Storia e Didattica delle
Matematiche, della Fisica e della
Chimica”**

Naïve Physics and Mental Models

Reasoning about devices

QuickTime™ and a
Photo - JPEG decompressor
are needed to see this picture.

Causal Models

- Causal models
 - Vosniadou & Brewer
 - Contain causal information
 - Go beyond what we learn
 - May have flaws

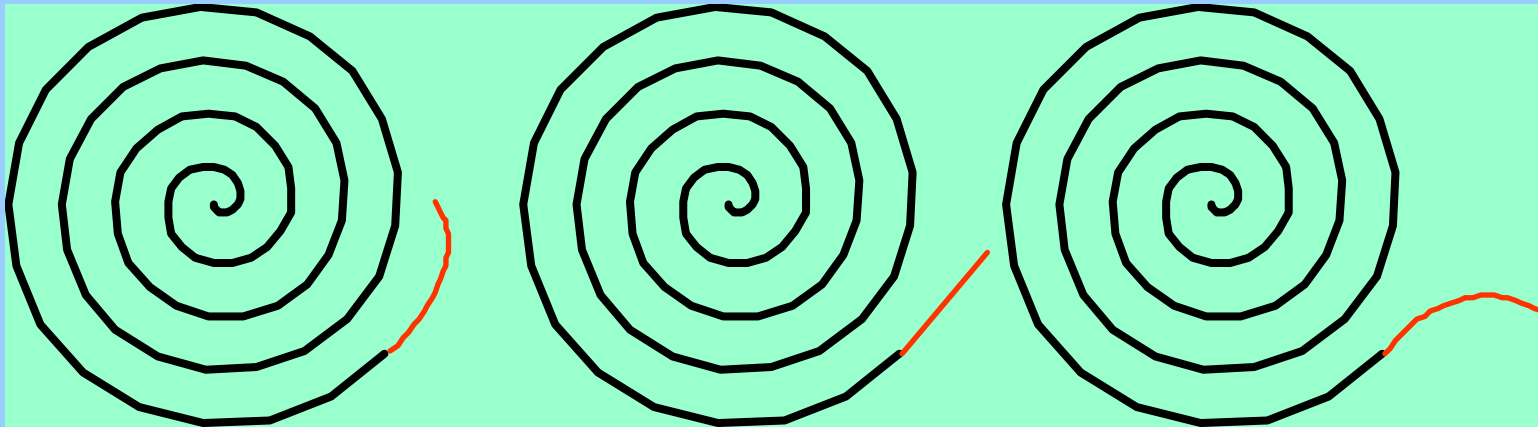
QuickTime™ and a
Photo - JPEG decompressor
are needed to see this picture.

Qualitative reasoning

- People generally do not reason about quantities
- Precise distances or specific relations among quantities
- We reason qualitatively
 - If one quantity increases, another decreases
 - Boundary conditions
 - Water flow occurs when the level in one container is larger than the level in the other.

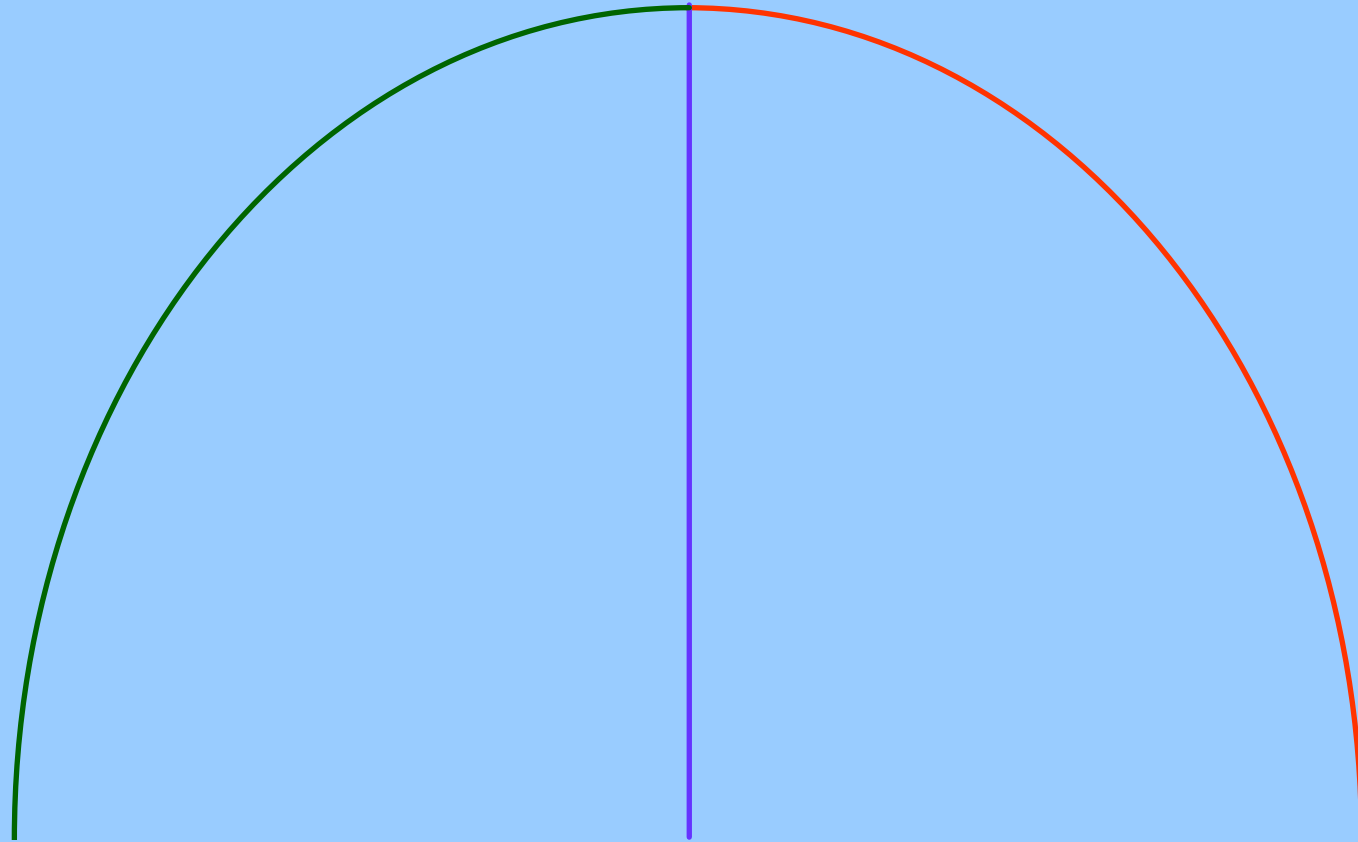
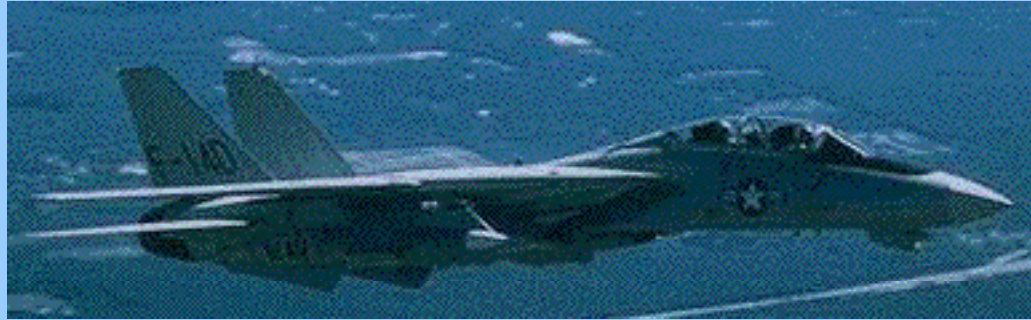
Naïve physics

- What would happen to a ball shot through this pipe?



- People often respond by assuming curvilinear momentum
 - McCloskey and Proffitt
- Even happens if they carry out an action.

- What would happen to a bomb dropped from this plane?



Other areas of naïve physics

- Reasoning about collisions
- Piagetian Water Level Problem
- Reasoning about movement
 - Importance of embodiment in judging distances
 - Visual information is not enough
 - Vestibular information needed for rotation

Why do we err?

- Our naïve physics matches our observations
 - The world has friction, and so there are unseen forces that act in opposition to seen forces
 - Our naïve physics is often accurate for things we can do with our bodies
 - Only when we create larger machines do the differences become important.
- Should not be a surprise
 - Newtonian physics is only a few hundred years old
 - Aristotelian mechanics is closer to our daily experience