



CMACS
Computational Modeling and Analysis for Complex Systems

Models and Modeling

CMACS Models



CMACS Models We Will Use

- Wiring diagrams for Chemical Reactions
- Mathematical Models (Differential Equations)
- Computer Models (RuleBuilder)

EMACS | What good are models?

Models are abstract descriptions of the world.

They are easier to work with and think about than real objects.

EMACS | Thought Experiments


A proposal for an experiment that would test or illuminate a hypothesis or theory.

Based on a model.

EMACS | Falling Objects

- **Aristotle:** The heavier an object, the faster it falls.
- **Galileo:** All objects will fall at the same speed in a vacuum.

EMACS Falling Objects




Salviati. If then we take two bodies whose natural speeds are different, it is clear that on uniting the two, the more rapid one will be partly retarded by the slower, and the slower will be somewhat hastened by the swifter. Do you not agree with me in this opinion?

EMACS Falling Objects



Simplicio. You are unquestionably right.

EMACS Falling Objects



Salviati. But if this is true, and if a large stone moves with a speed of, say, eight while a smaller moves with a speed of four, then when they are united, the system will move with a speed less than eight; but the two stones when tied together make a stone larger than that which before moved with a speed of eight.

EMACS Falling Objects



Salviati. Hence the heavier body moves with less speed than the lighter; an effect which is contrary to your supposition. Thus you see how, from your assumption that the heavier body moves more rapidly than the lighter one, I infer that the heavier body moves more slowly.

EMACS What other thought experiments do you know?

EMACS Computers and Models

Computers let us put models on steroids!!

We can “think” about the consequences of the model by running a computer simulation, by using the computer to solve equations, or by using it to study model properties.
