

Full title: **Mathematical Models, Mental Models and Thinking:**

Short title: **Models and Thinking**

by Daniel Solomon

Abstract:

This talk is about models mental, mathematical or otherwise. I will discuss why we need models, their main building blocks and why they can go wrong/why otherwise reasonable people can get into (intellectually) violent arguments about them.

I will argue that models are everywhere around us and in our heads (though we spend most of our lives and thoughts unconscious about this). Explicit awareness of and study of models makes humans more conscious of our environment and our minds, which may be good for its own sake (like art) or may occasionally improve human thinking and decisions.

A model of this talk:

- Mappings/Representations of reality. Models as mappings.
- Examples1: real models, models of Vilnius.
- Mental models. *Mind: Perceptions -> Mental models -> Thoughts -> Feelings -> Decisions.*
- Mathematical models. *M: Perceptions -> A, x, P(A, x), F(x)=0.* The tools: formal logic (To be or not to be?), set theory (to belong or not to belong?), algebra (being=1 or being=0?), probability (maybe, partially being?).
- Form versus content. The formal model M and the mental interpretation of M, *inv_M*. Conscious versus unconscious thought.
- Models versus theories/frameworks. Theory as a collection of models (a meta model).
- Examples2: models of the mind and individual decision making.
- Choosing between models: statistical versus other criteria. Should we choose a model? Or should we combine many models? The fox versus the hedgehog.
Example 3: models of many minds interacting together in a society: collective/aggregate choice, macroeconomic models.