

GR and BH theory are extremely exciting, new frontier areas of science. It is an inviting application area for logic and logicians. We claim that logic can be fruitfully applied in this field.

# INTRO

This presentation consists of 4 parts:  
Introduction (present part),  
Part I: Special relativity theory,  
Part II: Theory of accelerated observers (in special relativity),  
Part III: General Relativity.

## AIMS OF OUR SCHOOL

- ☞ Base Relativity Theory on simple, unambiguous axioms with clear meanings
- ☞ Make Relativity Theory:
  - ⤴ More transparent logically
  - ⤴ Easier to understand and teach
  - ⤴ Modular and easier to change
- ☞ Demystify Relativity Theory
- ☞ Analysis of the logical structure of Relativity Theory

In our research group, we are working on a logic based approach to relativity, and related areas like black hole physics, wormholes, cosmology. There are 3 uses of such an approach:

1. One is foundational. We build a logic based foundation for relativistic physics in the style of the success story of FOM (Foundation of Mathematics). We use methods from FOM and reverse mathematics.
2. The second use is demystifying RT, moreover making it accessible for logicians without relying on “physical intuition”.
3. This is a testing area for the methods of logic, may rejuvenate logic.

# PLAN OF OUR PRESENTATIONS

Logical analysis of:

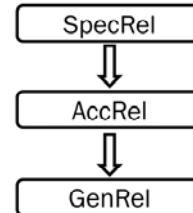
- ^ Special relativity theory

Transition to:

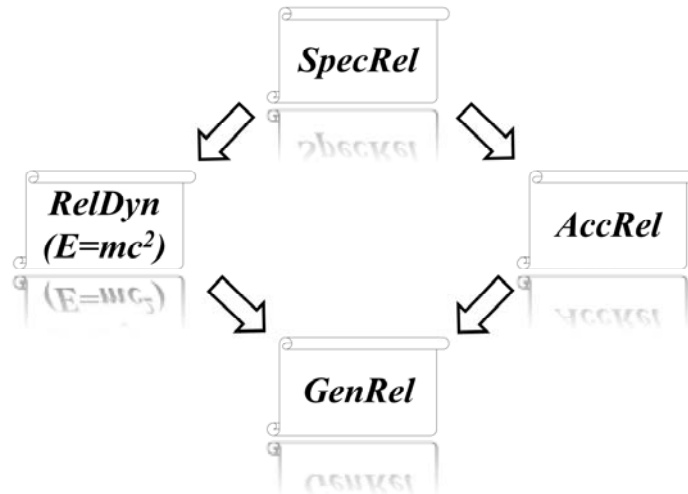
- ^ Accelerated observers and Einstein's EP

Transition to:

- ^ General relativity
- ^ Exotic space-times, black holes, wormholes
- ^ Application of general relativity to logic
- ^ Visualizations of Relativistic Effects
- ^ Relativistic dynamics, Einstein's  $E=mc^2$



# STRUCTURE OF OUR THEORIES



## AIMS OF OUR SCHOOL

☞ R.T.'s as theories of First Order Logic

**S. R.**



$SpecRel \subseteq FOL$

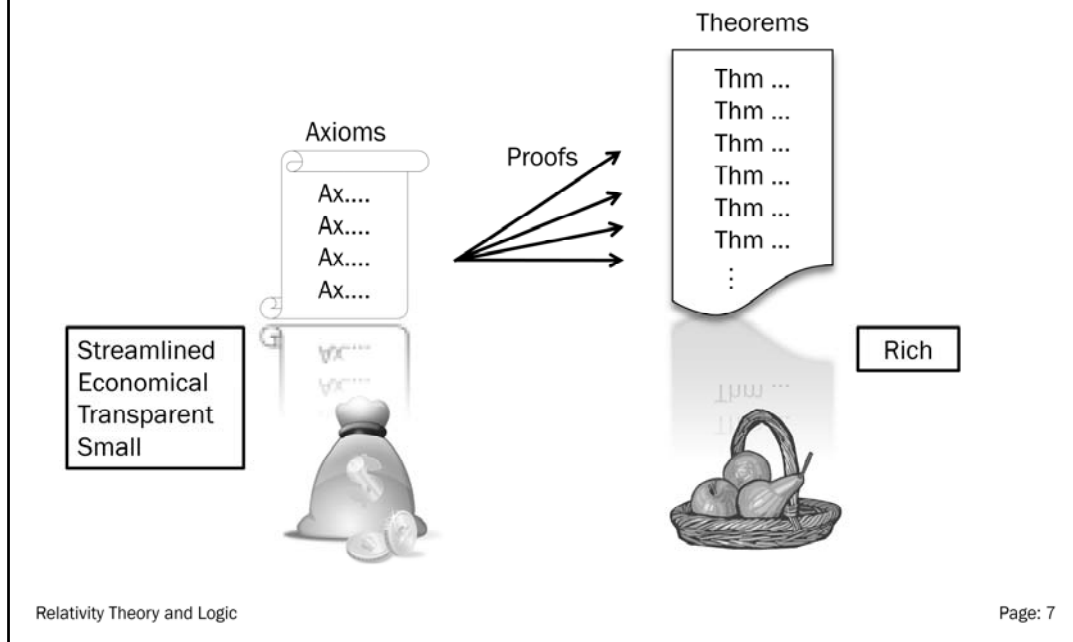
**G. R.**



$GenRel \subseteq FOL$

We build up R.T.'s as theories in the sense of logic.  
Actually our R.T.'s will be theories of First Order Logic.  
We use plain FOL (First Order Logic) as in FOM  
(Foundation of Mathematics)  
Leather-bound boxes for official theories

# LOGIC AXIOMATIZATION OF R.T.



We aim for good price-value ratio . Axioms are price, theorems are value.

We want surprising, shocking, paradoxical predictions of RT as theorems and not as axioms.

Key point: no fancy statements among the axioms.

# PART I

## Special Relativity

Comes in the next presentation.