

# The Old Gravity The New Life

Hongbao Zhang

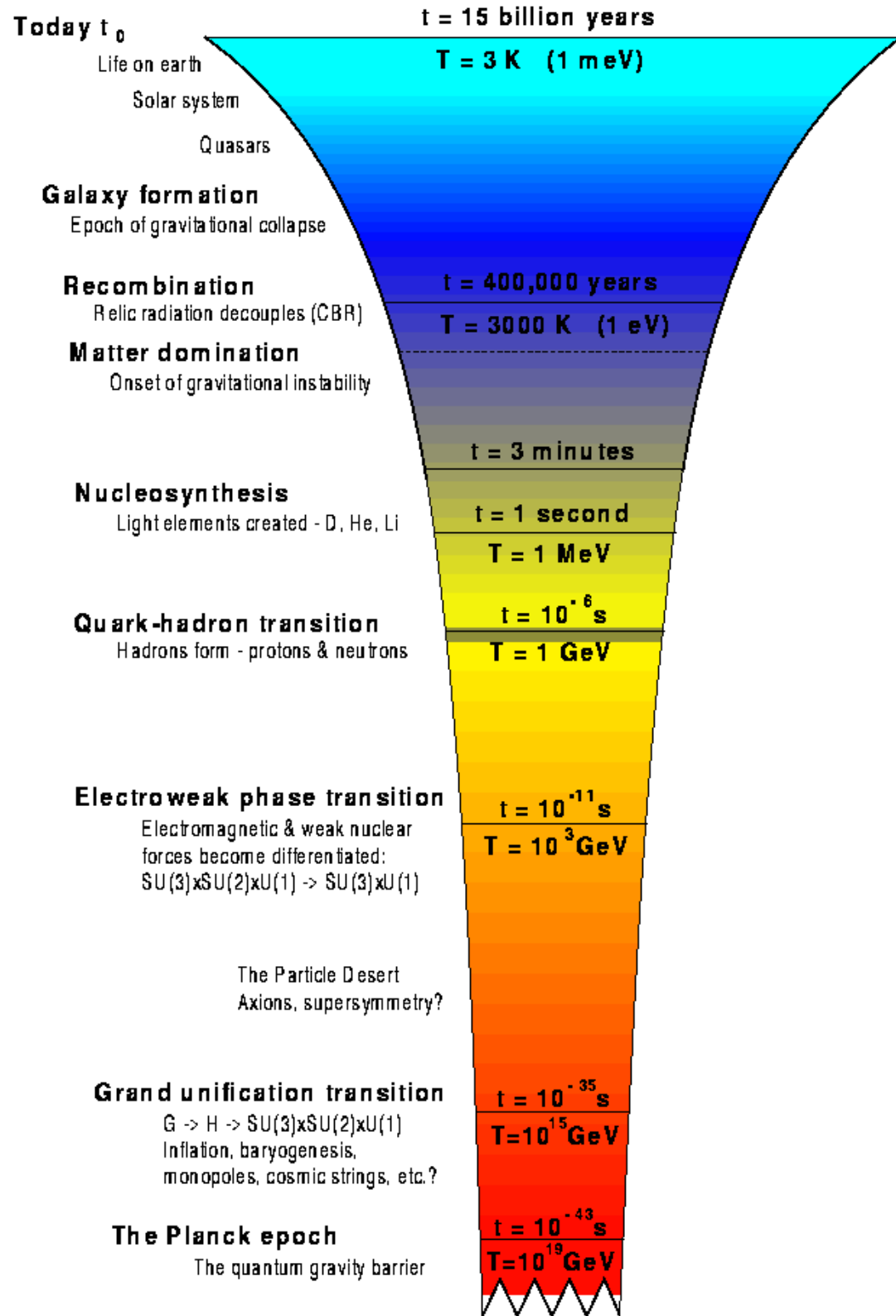


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for Theoretical Physics

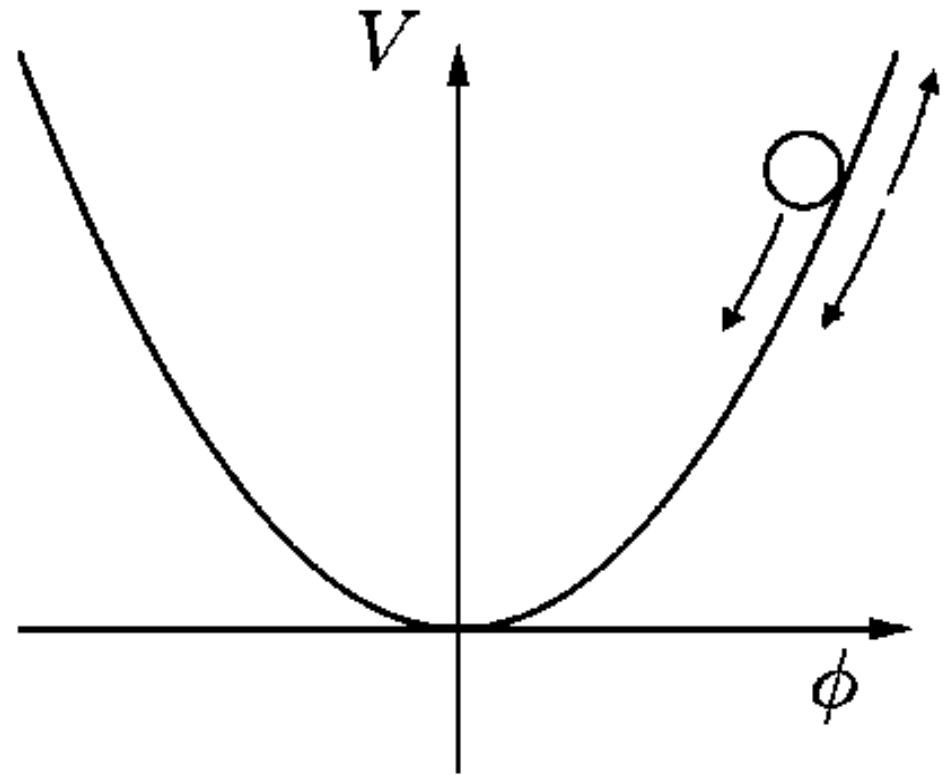
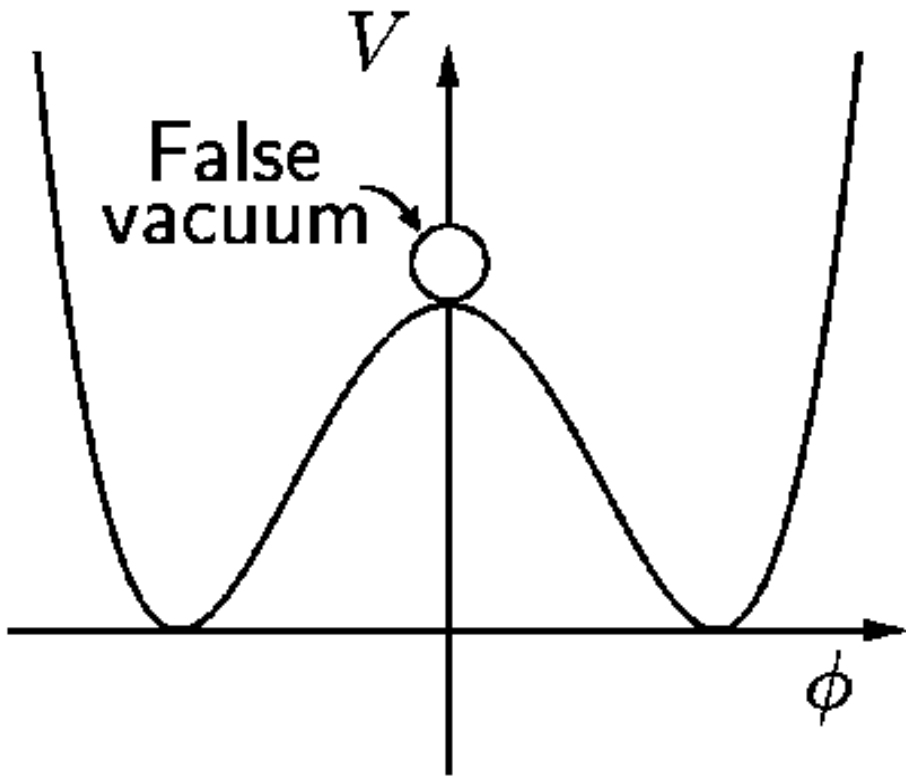


# Outline

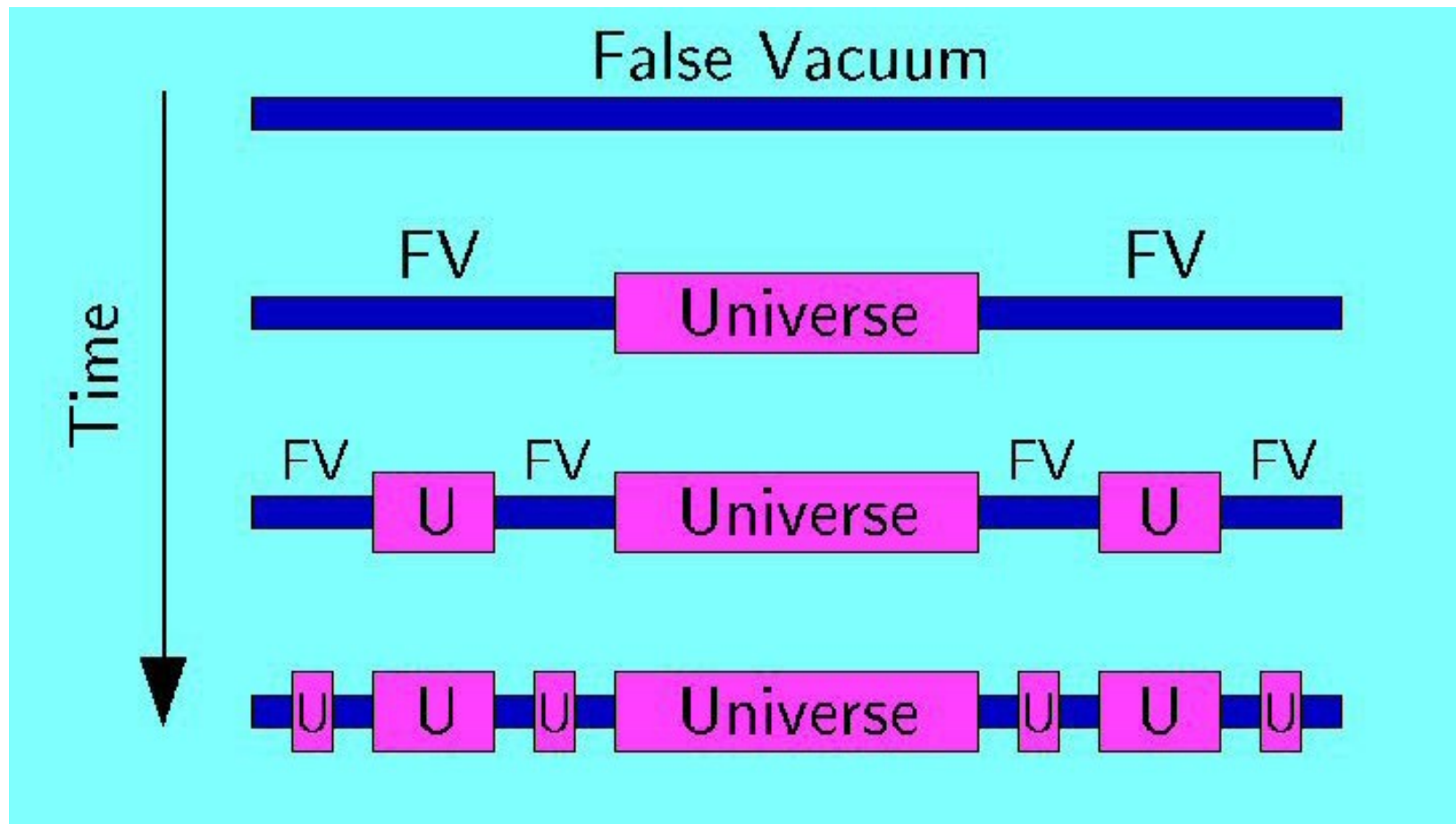
- The history of the universe
- The history of road to unification in physics



# Eternal Inflation I

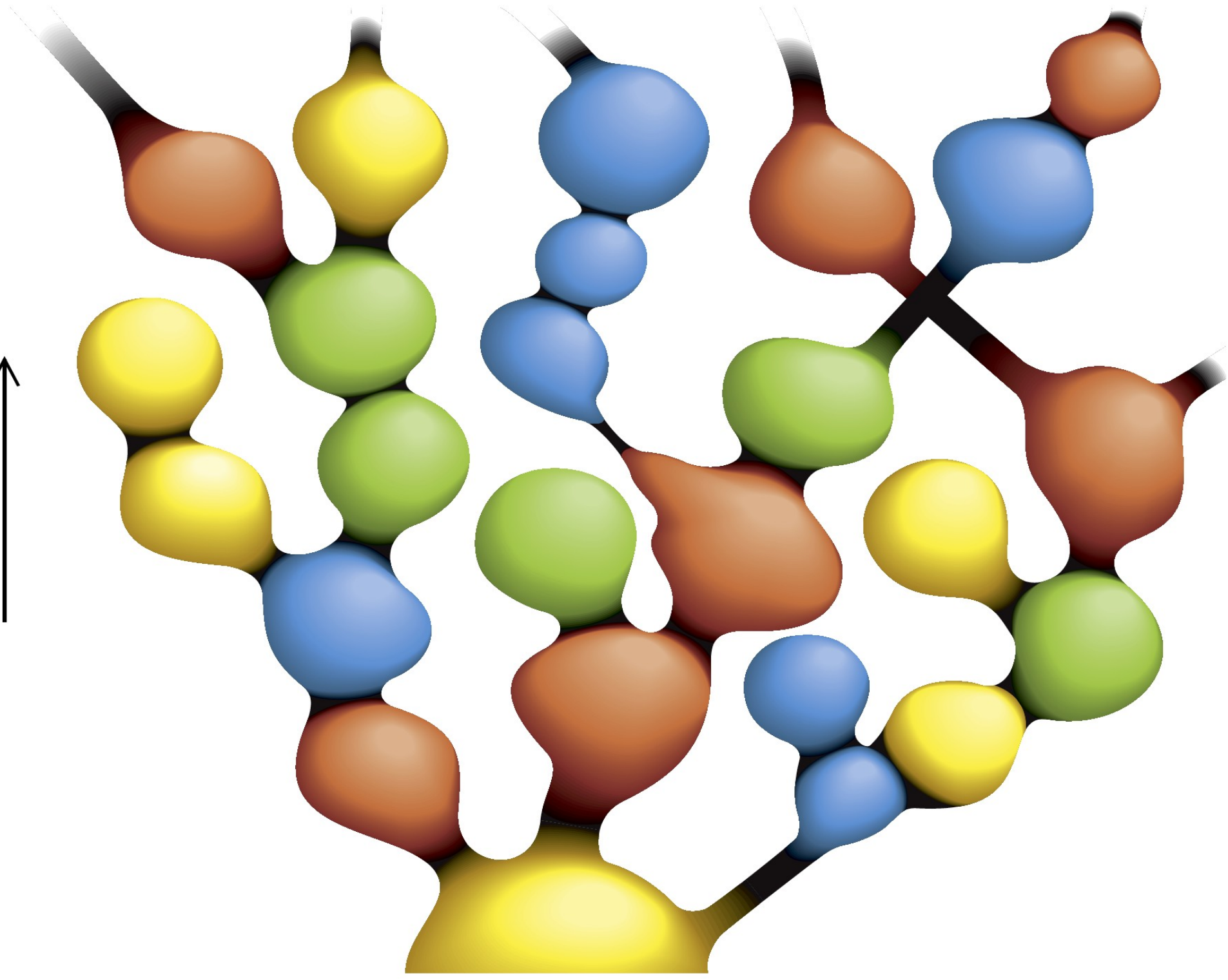


# Eternal Inflation II





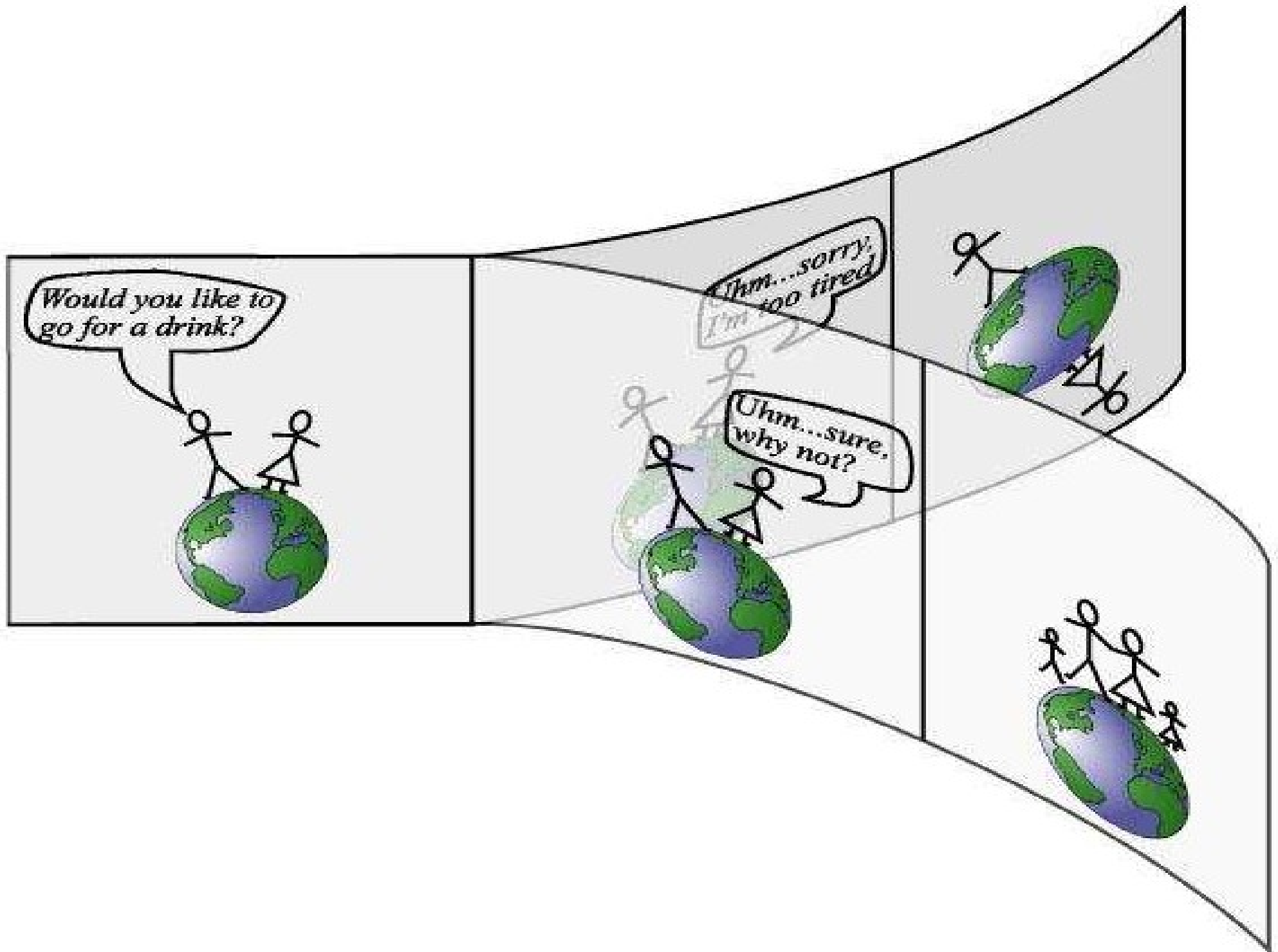
TIME ↑



# Multiverses

- Far away in space
- Infinitely far away in space
- Elsewhere in Hilbert space
- Elsewhere in math space

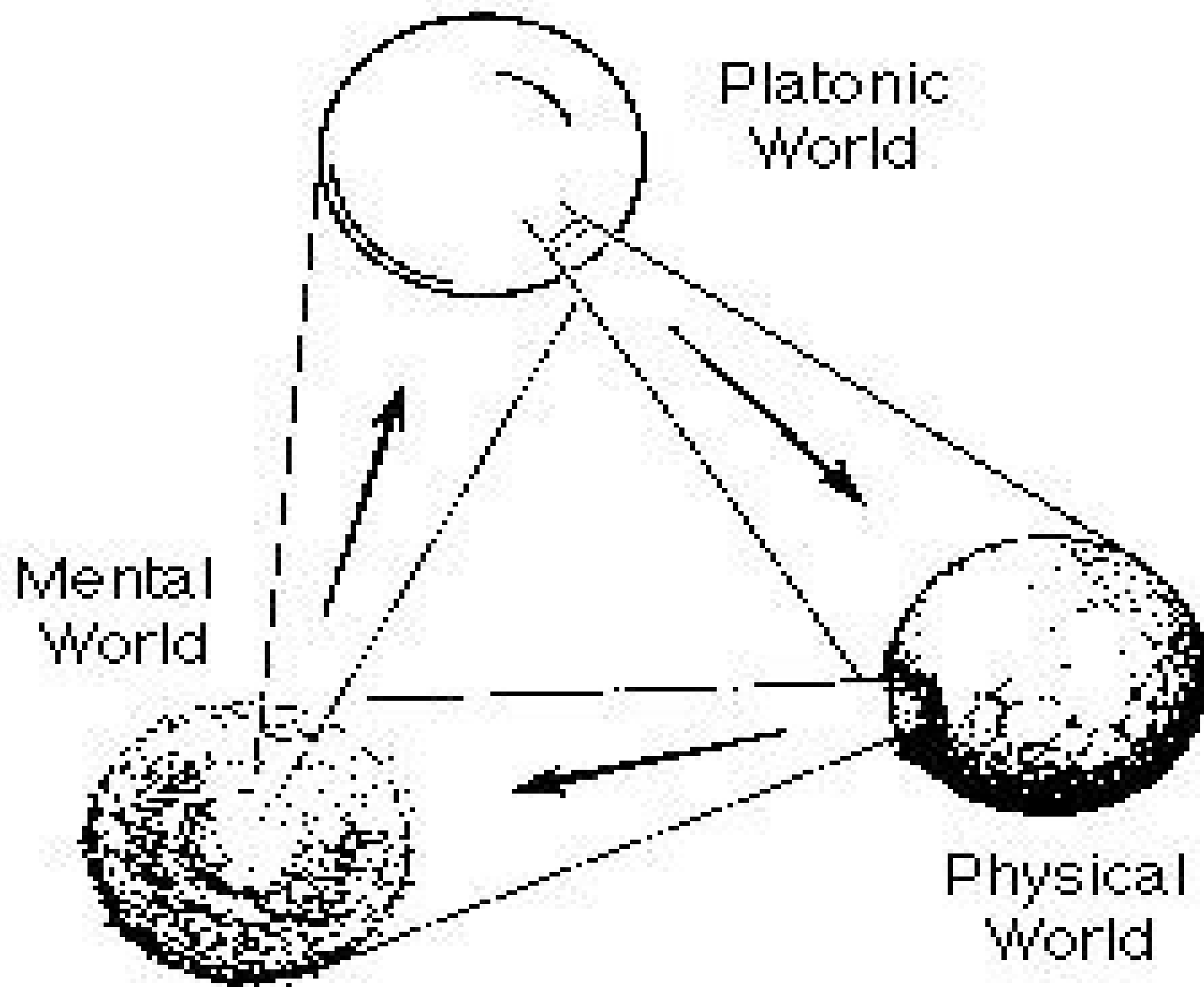




Would you like to go for a drink?

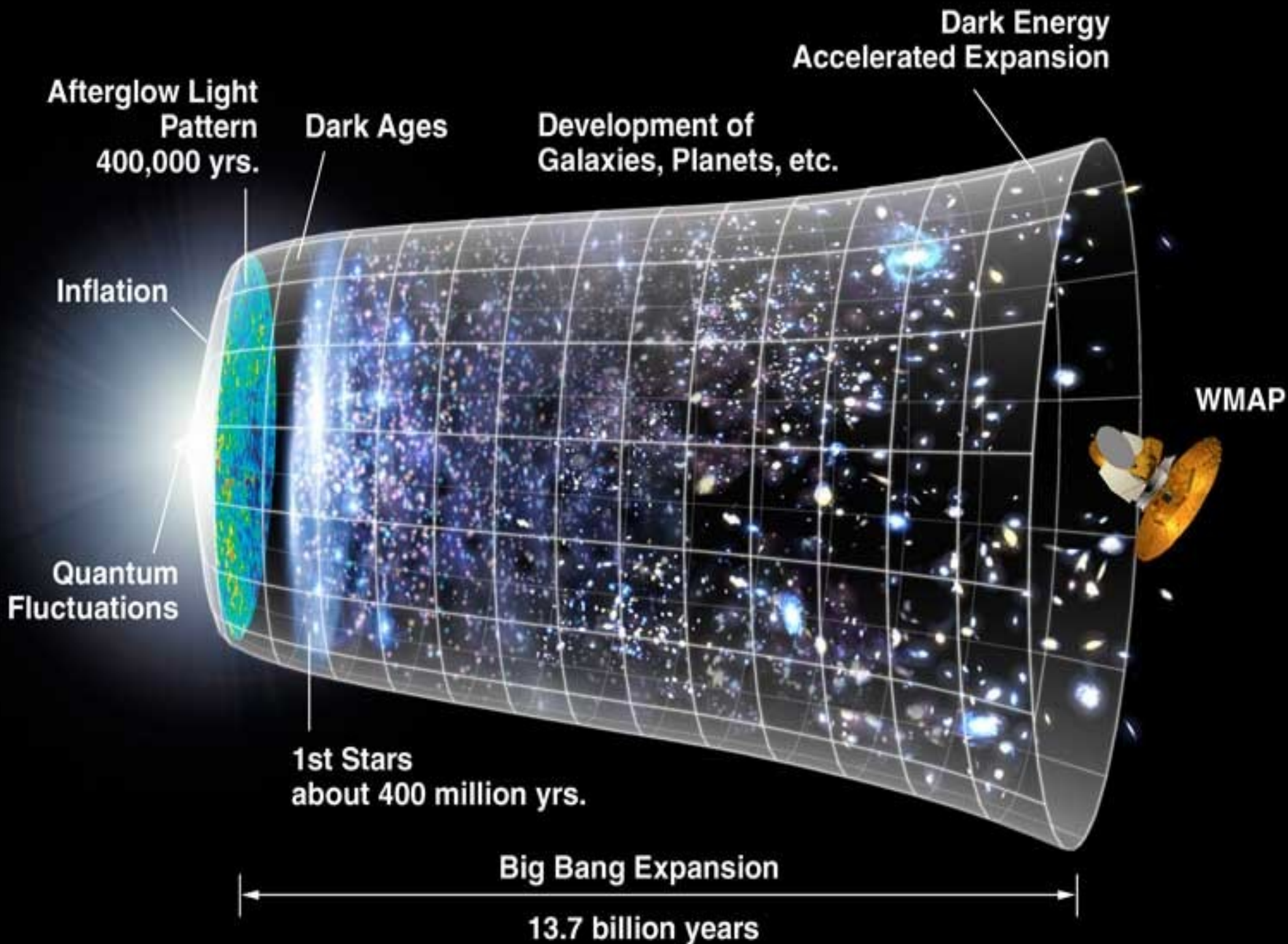
Uhm...sorry, I'm too tired

Uhm...sure, why not?



# Before The Big Bang: Cyclic Scenarios

- Penrose's cyclic universe
- Steinhardt and Turok's ekpyrotic universe
- Smolin's baby universe
- Bounce model in loop quantum cosmology



# Dark Cosmos

- Dark ages
- Dark matter
- Dark energy
- Dark future?

活着就是做有意义的事，有意义的事就是好好活着



# Newton Unifies Apples and The Moon

## Zero Gravity: The Lighter Side of Science

### Good Science

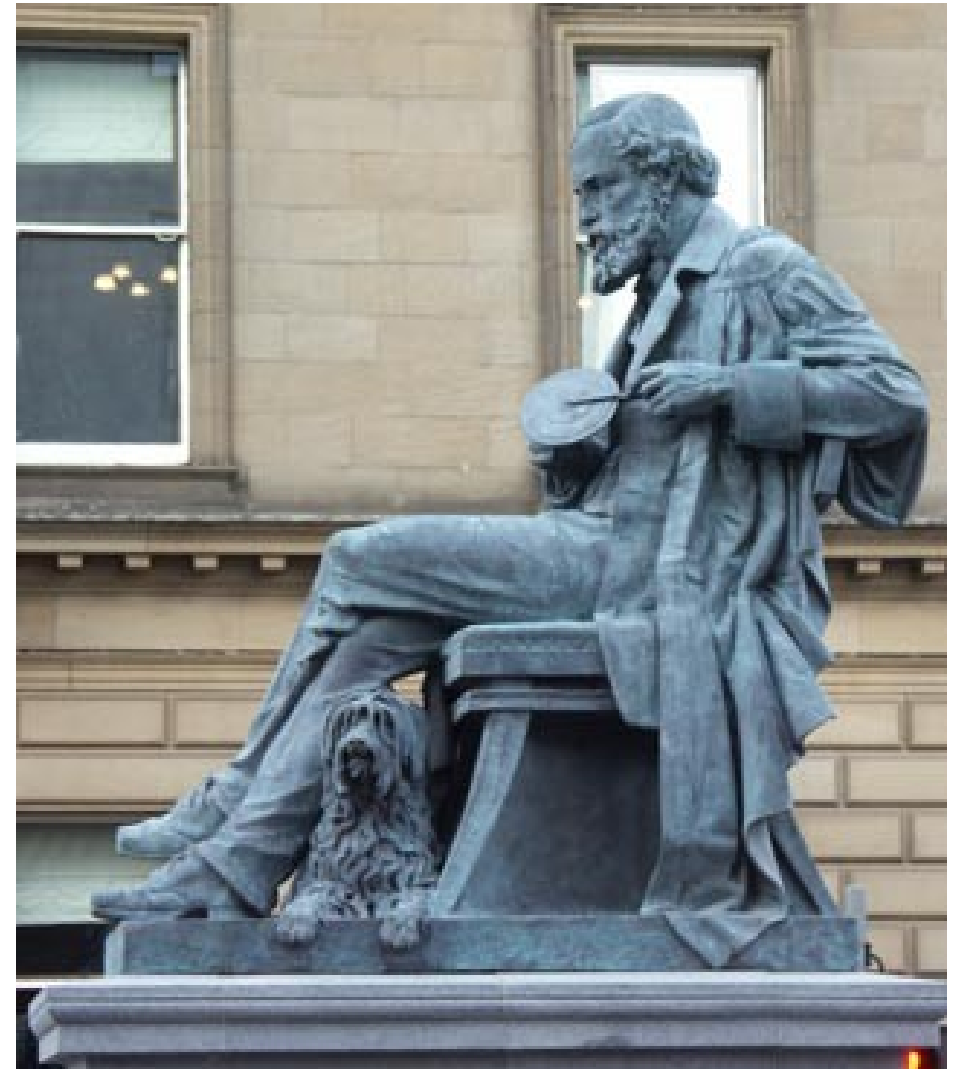
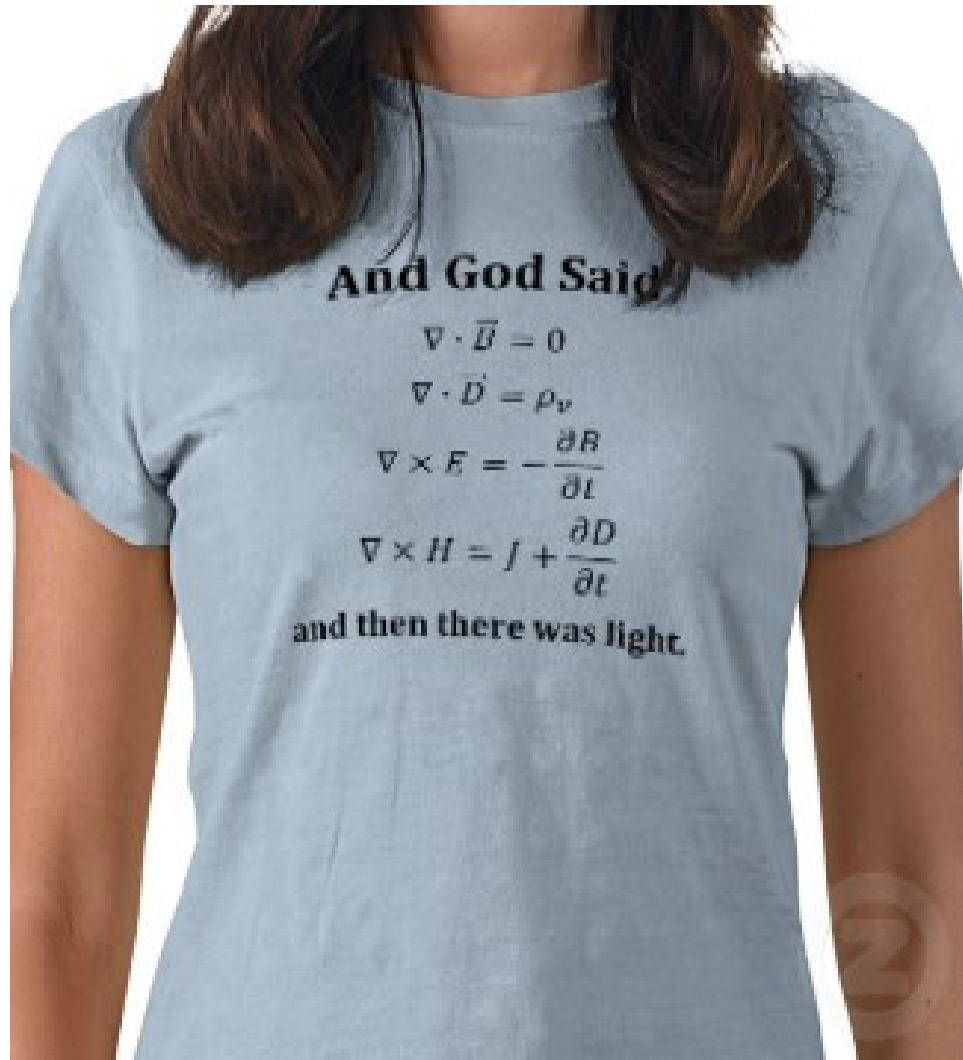
1. Apple falls on Newton's head.
2. Newton discovers Law of Universal Gravitation.

### Bad Science

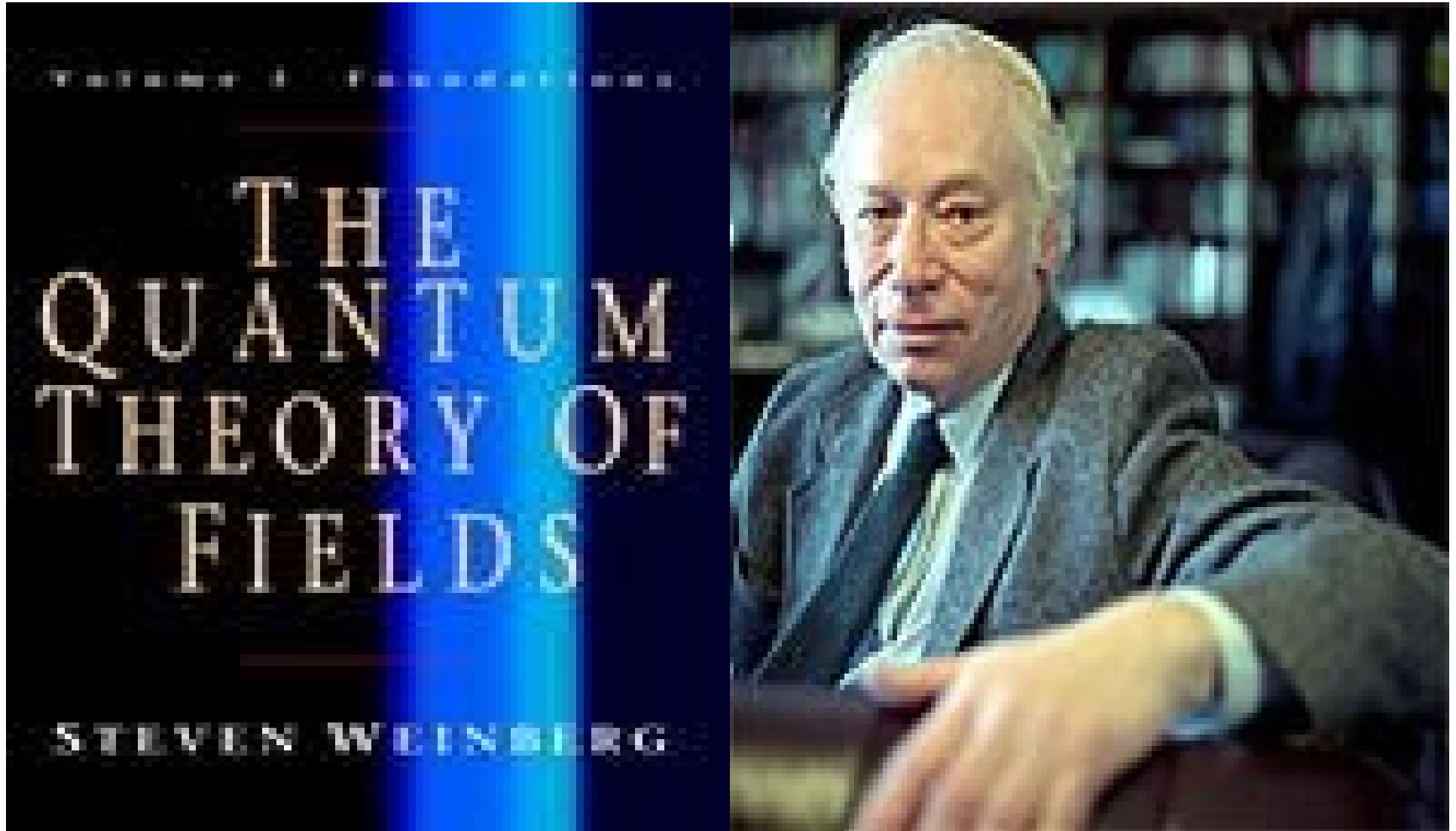
1. Apple falls on Newton's head.
2. Newton publishes the following paper:  
*On the Impact of a 0.12 kg Apple with the Head*



# Maxwell Unifies Electricity and Magnetism

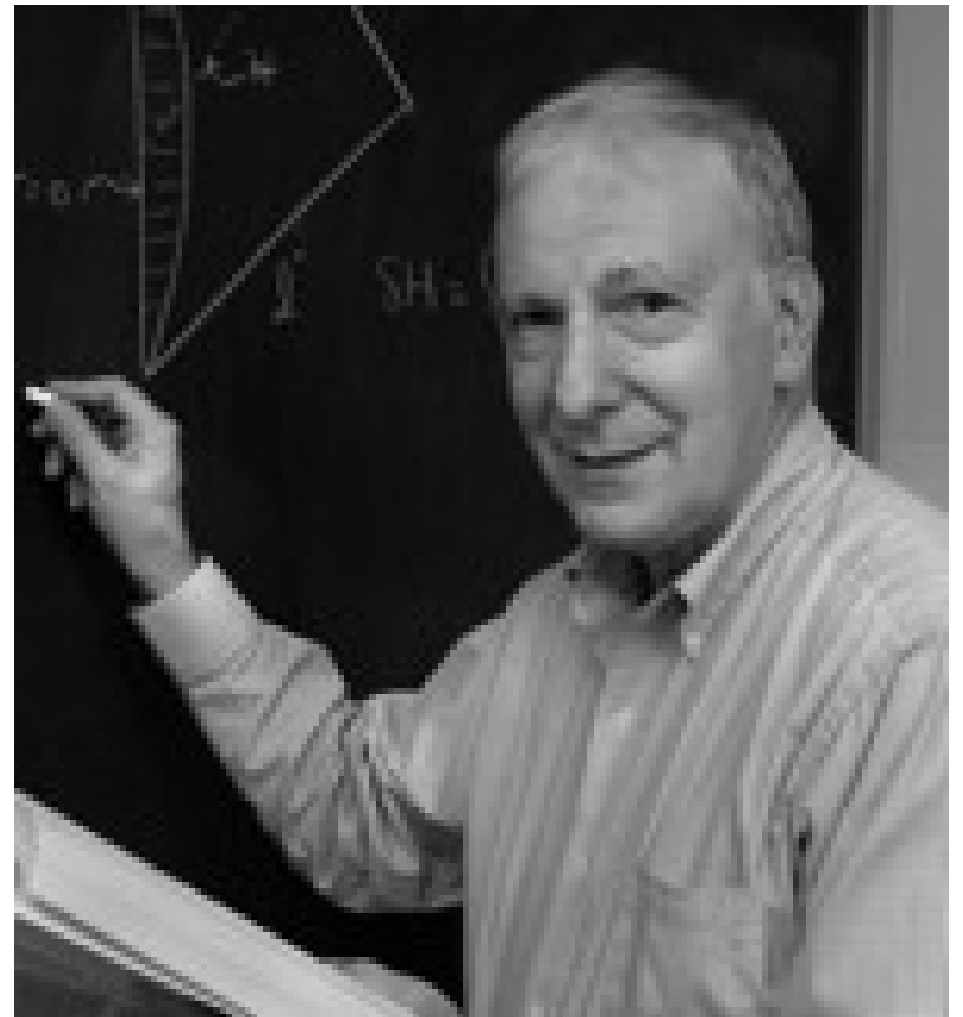
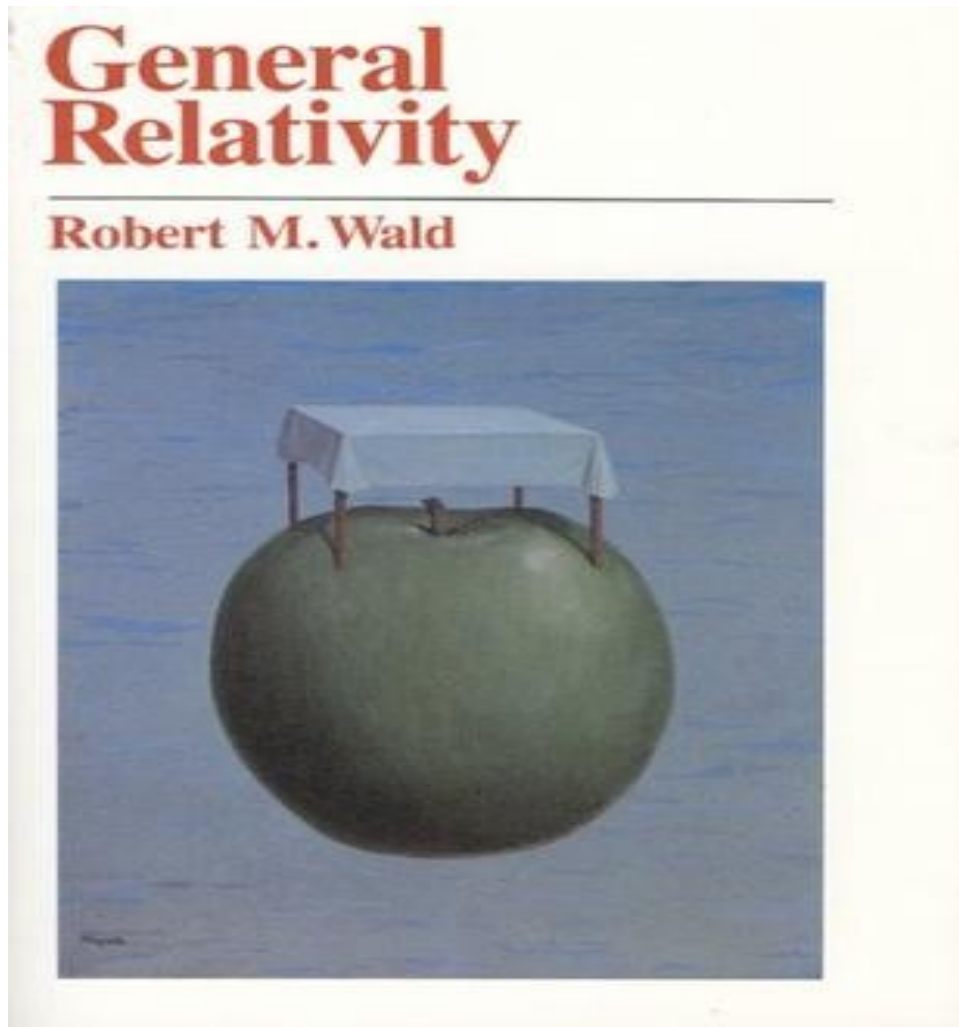


# Quantum Theory Unifies Particles and Fields





# Gravity Is Geometry, So What?



# Strings versus Loops



BRIAN GREENE

VS.



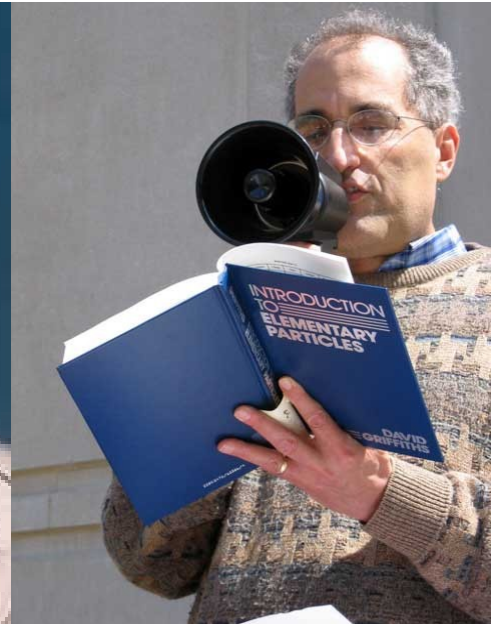
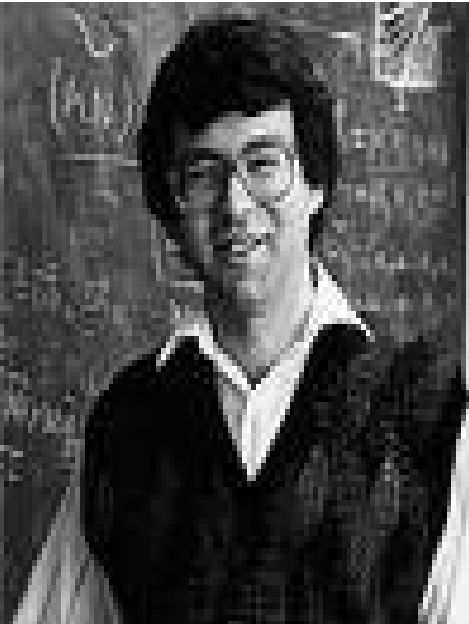
LEE SMOLIN

# String Theory

- J. Polchinski, String Theory(1998)
- K. Becker, M. Becker, and J. H. Schwartz, String Theory and M Theory(2007)
- E. Kiritsis, String Theory in a Nutshell(2007)



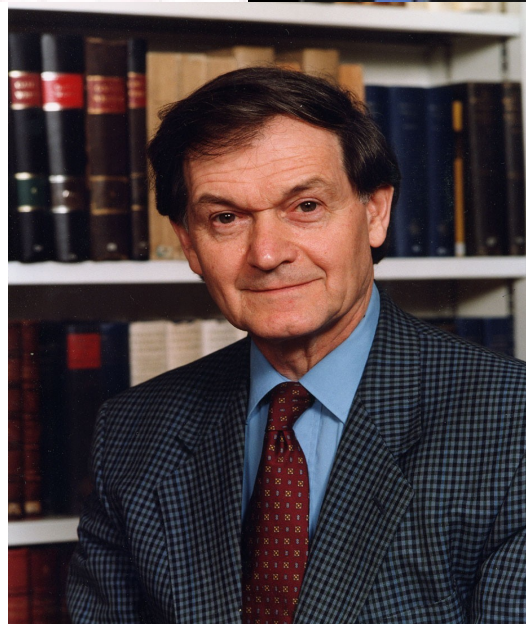
# AdS/CFT Correspondence I



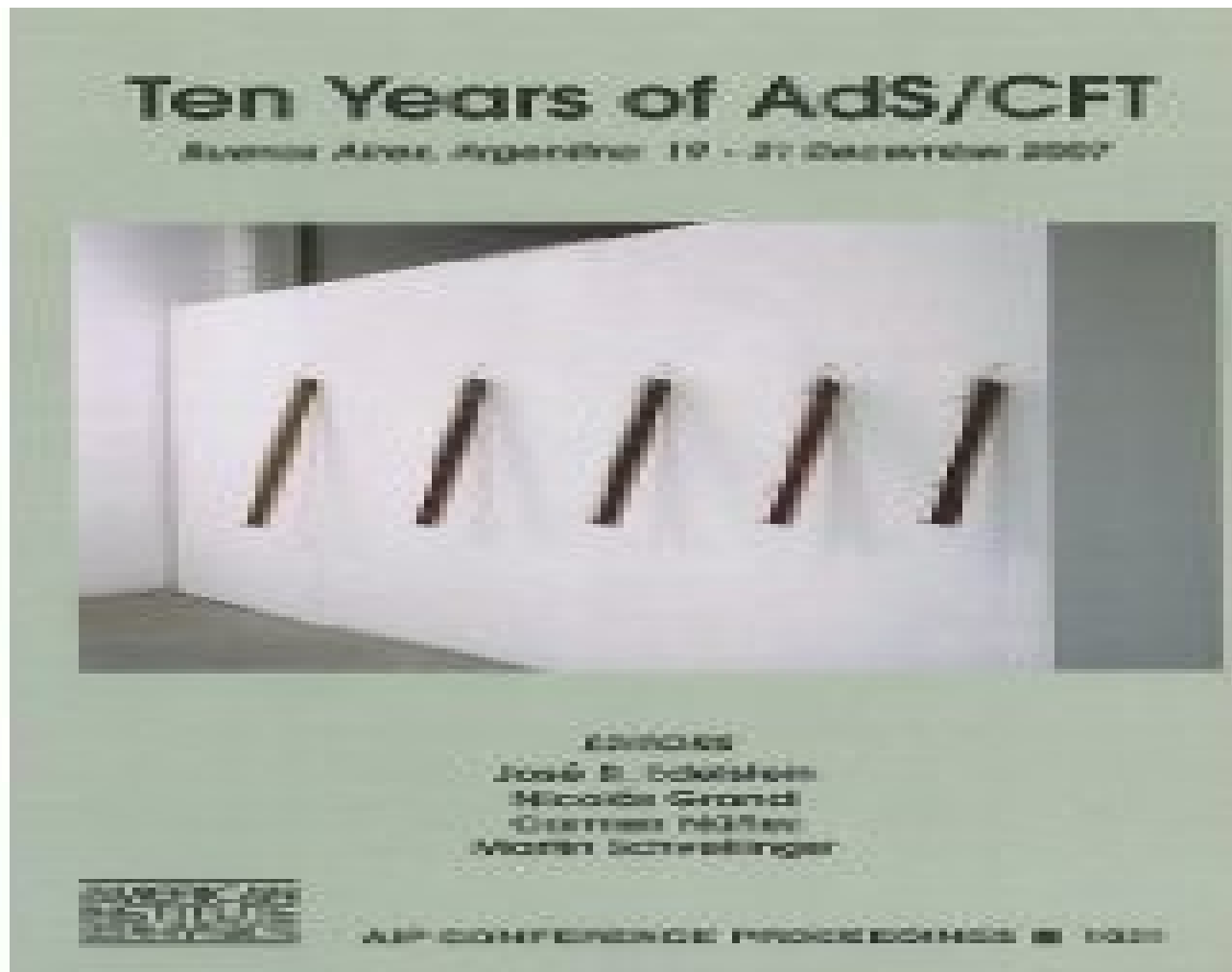
# AdS/CFT Correspondence II

$$\left( \text{AdS/CFT} \right) = Z_S[\phi_i]$$

# AdS/CFT Correspondence III



# AdS/CFT Correspondence IV



**This Is The Moment!**

**Thanks**