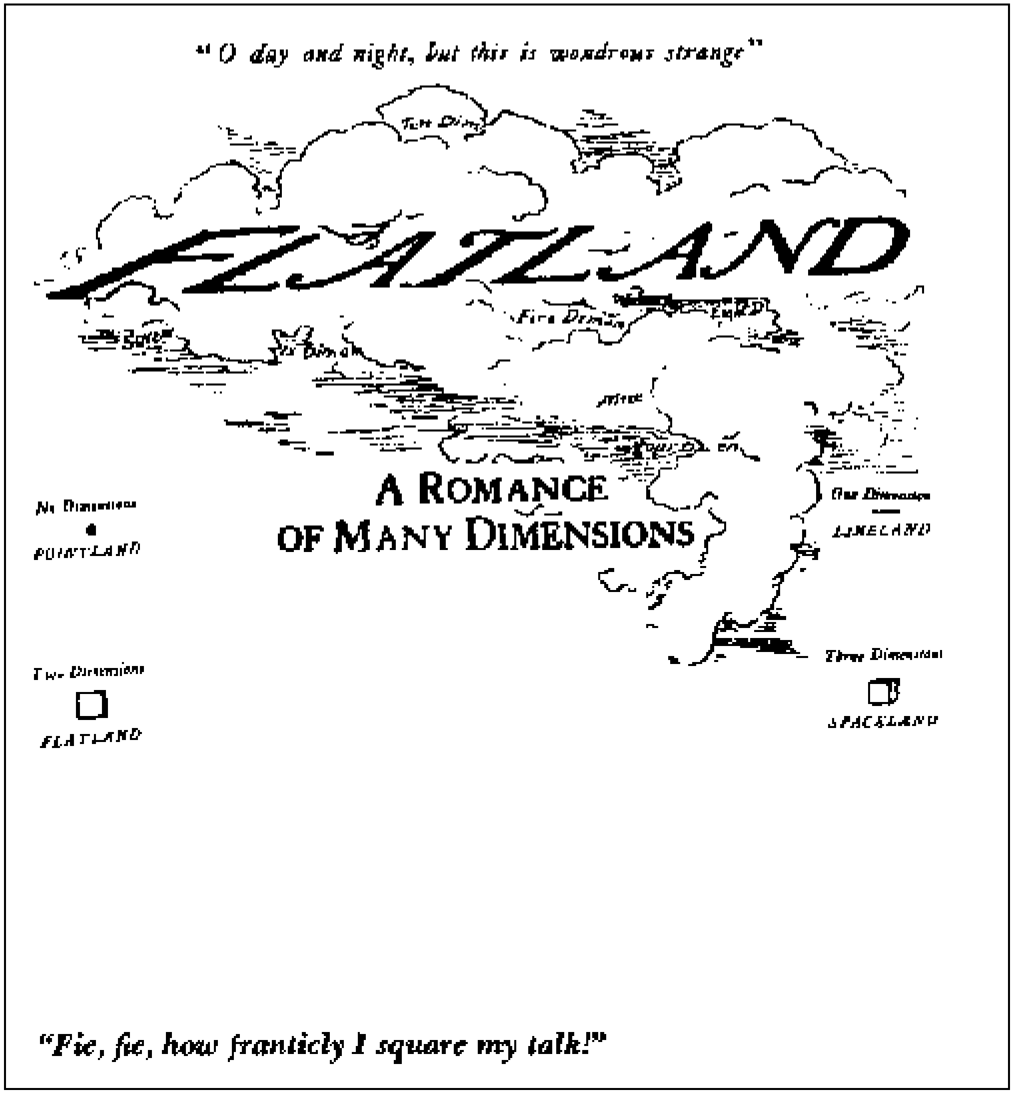
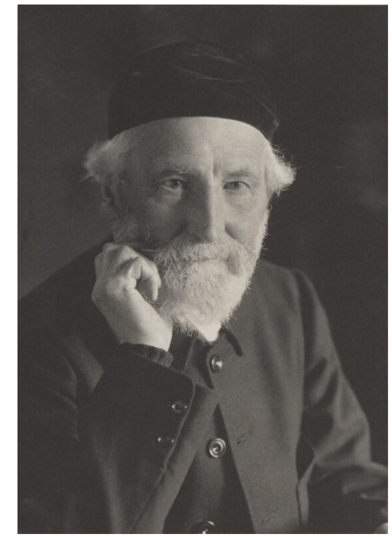
B2
Symmetry and Relativity
Lecture 3





Edwin A Abbott

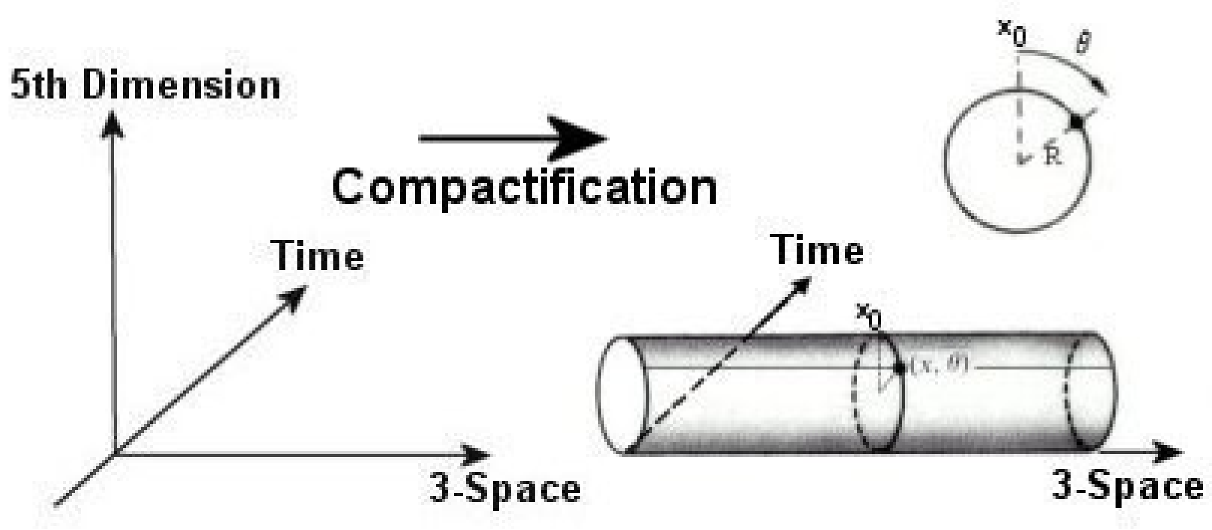
1884

Problems with 4+1D

- Why don't we see/feel/touch extra dimension?
  - Something must keep us in 3+1-land
- If we can explain why, does it have other implications?

T Kaluza (1919), O Klein (1926)

- Electromagnetism + gravity in 5D
- Tightly curled up 5th dimension
- Periodic boundary condition



Arkani-Hamed/Dimopoulos/Dvali

- Standard Model confined to 4D, gravity in 5D (1998)
- One way to explain weakness of gravity
- Model-building:
  - See if Nature acts this way, explain later

Funny thing on the way to work...

Strengthening interacting agegraphic dark energy DGP constraints with supernovae and multimessenger forecastings

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An explanation of the nature of dark energy has been treated in extra dimensions within the scheme of string theory. One of the most successful models is inspired by the Dvali-Gabadadze-Porrati (DGP) model, in which the universe is a 4-dimensional brane embedded in a 5-dimensional Minkowski space-time. In this landscape, the study of the evolution of the normal branch has led us to different kinds of dark energy, where the most simple case is the cosmological constant Λ. Moreover, other viable cosmological solutions are related to agegraphic dark energy, which allows a late cosmic acceleration within an interacting mechanism. To explore the viability of these solutions and a possible gravitational leakage, in this paper, we present constraints on such models using recent standard sirens forecasting in addition to local observables such as Supernovae Type Ia. Our results show that the value associated with the species of quantum fields n in these models is strongly restricted for supernovae observations to $n = 20$, and for GW standard sirens mock data prefers a value of $n = 1$.

3 Brane Friedmann equations

The purpose of this section is to derive Friedmann like equations for the brane metric. We will consider five-dimensional spacetime metrics of the form

$$ds^2 = \tilde{g}_{AB} dx^A dx^B = g_{cd} dx^c dx^d + b^2 dy^2, \tag{9}$$

where y is the coordinate of the fifth dimension and we will adopt a brane-based approach where the brane is the hypersurface defined by $y = 0$. Being interested in cosmological solutions, we take a metric of the form

$$ds^2 = -n^2(\tau, y) d\tau^2 + a^2(\tau, y)\gamma_{ij} dx^i dx^j + b^2(\tau, y) dy^2, \tag{10}$$

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