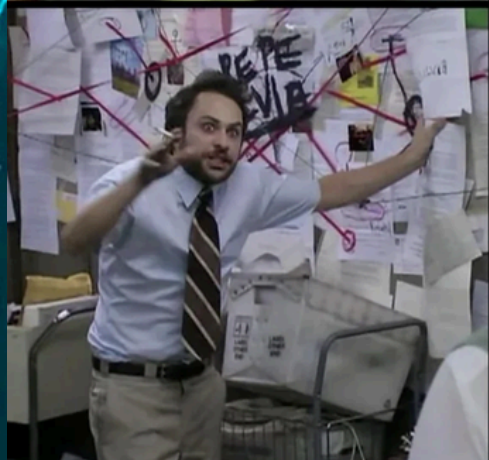




Physics class in
school



My proposed Physics
theory as a hobby

PLAYING GOD...

WHAT IF...

WE ADDED AN EXTRA DIMENSION ?



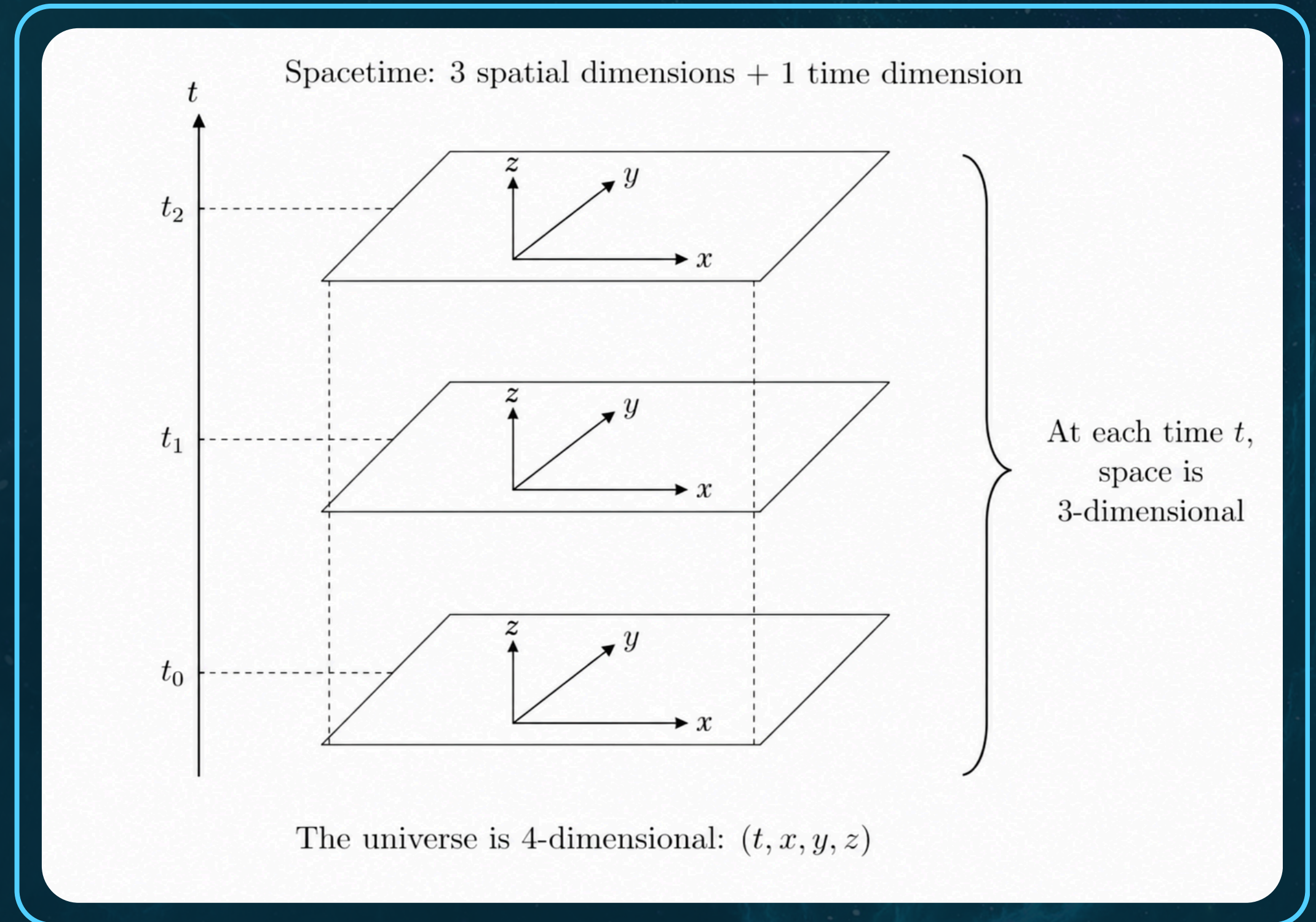
GENERAL RELATIVITY

$$x^\mu = (t, x, y, z)$$

$$ds^2 = g_{\mu\nu} dx^\mu dx^\nu$$

In flat spacetime...

$$\eta_{\mu\nu} = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$



NEW DIMENSION!

$$x^\mu = (t, x, y, z) \longrightarrow \hat{x}^\alpha = (t, x, y, z, \omega)$$

How should this extra (spatial) dimension be (to be realistic)?

One simple possibility of hidden dimension

FROM A DISTANCE

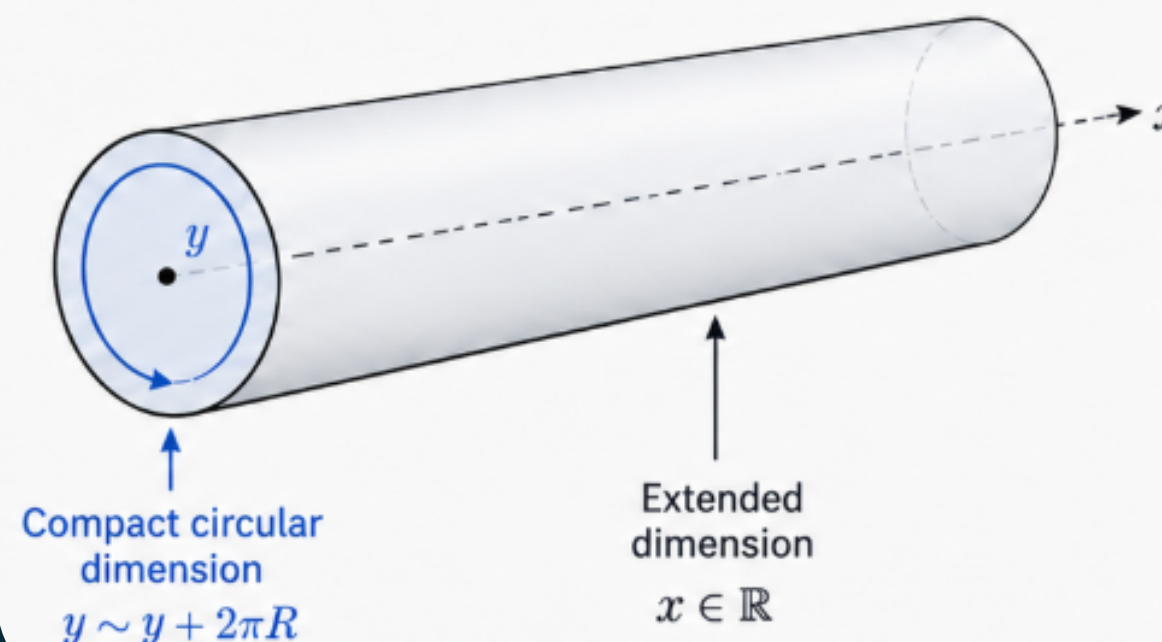
Appears 1-dimensional



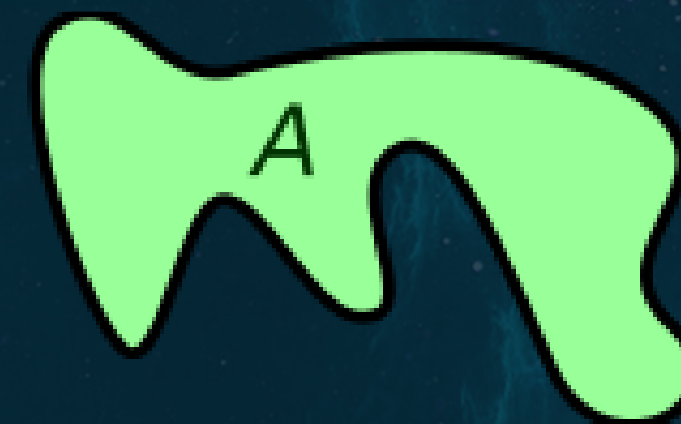
Small

UP CLOSE

Actually a cylinder: 1 extended + 1 compact dimension



Compact



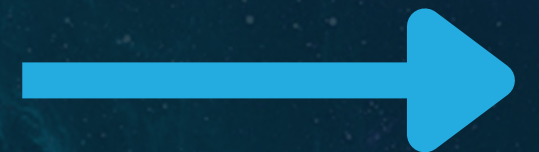
Connected

CONSEQUENCES

$$\hat{g}_{\hat{\mu}\hat{\nu}} = \begin{pmatrix} \hat{g}_{\mu\nu} & \hat{g}_{\mu\omega} \\ \hat{g}_{\omega\nu} & \hat{g}_{\omega\omega} \end{pmatrix}$$



$$ds^2 = H_{\mu\nu} dx^\mu dx^\nu + 2B_\mu dx^\mu d\omega + C d\omega^2$$



$$\Psi(x^\mu, \omega) = \sum_{n \in \mathbb{Z}} \psi_n(x^\mu) e^{in\omega/R}$$

$$n = 0$$

$$\begin{aligned} H_{\mu\nu} &= H_{\mu\nu}(x^\mu) \\ B_\mu &= B_\mu(x^\mu) \\ C &= C(x^\mu) \end{aligned}$$



OLD FRIENDS?

SPIN-2 FIELD

$$ds^2 = \underbrace{(H_{\mu\nu} - \frac{1}{C} B_\mu B_\nu)}_{\gamma_{\mu\nu}} dx^\mu dx^\nu +$$

$$C \underbrace{(d\omega + \frac{B_\mu}{C} dx^\mu)^2}_{A_\mu}$$

SPIN-0 FIELD

SPIN-1 FIELD



$$\omega' = \omega - \lambda(x^\mu)$$

$$A'_\mu = A_\mu + \partial_\mu \lambda$$

$$F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$$

U(1) GAUGE FIELD



$$F'_{\mu\nu} = F_{\mu\nu}$$



$$S_{5D}^{\text{gravity}} \longrightarrow S_{4D} \sim -\frac{1}{4} \int d^4x \sqrt{-g} F_{\mu\nu} F^{\mu\nu} + S_{\text{scalar}}$$

ELECTROMAGNETISM <---> GEOMETRY?

THANK YOU



meme-arsenal.ru

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