

Title: Before Spacetime

Date: May 27, 2007 03:45 AM

URL: <http://www.pirsa.org/07050093>

Abstract:

BEYOND SPACETIME

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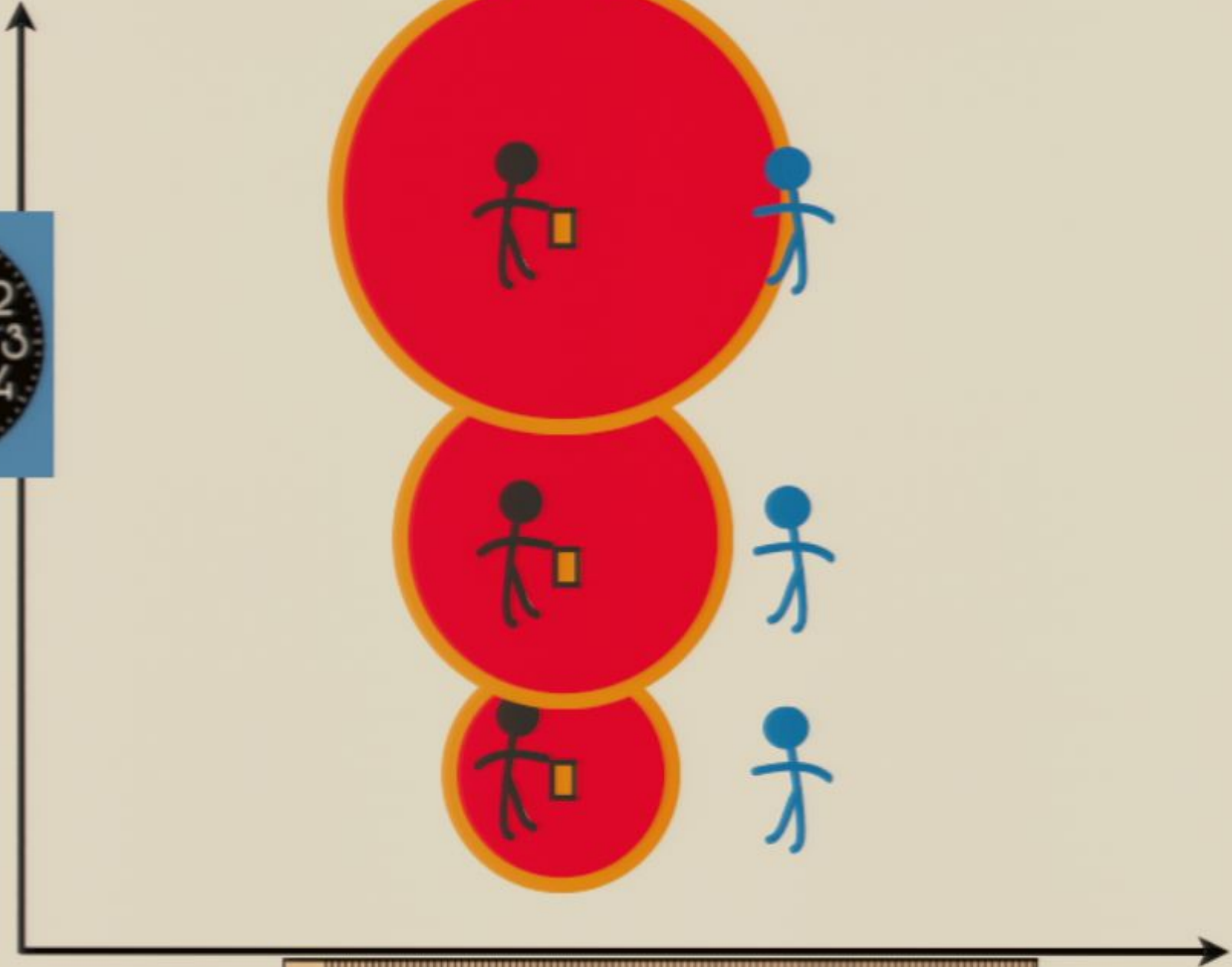














Galaxy Cluster Abell 1689.
Hubble Space Telescope - Advanced Camera for Surveys (NASA)

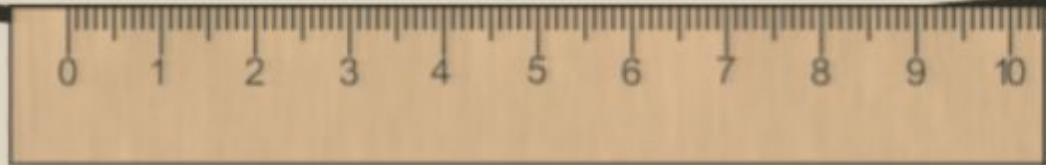


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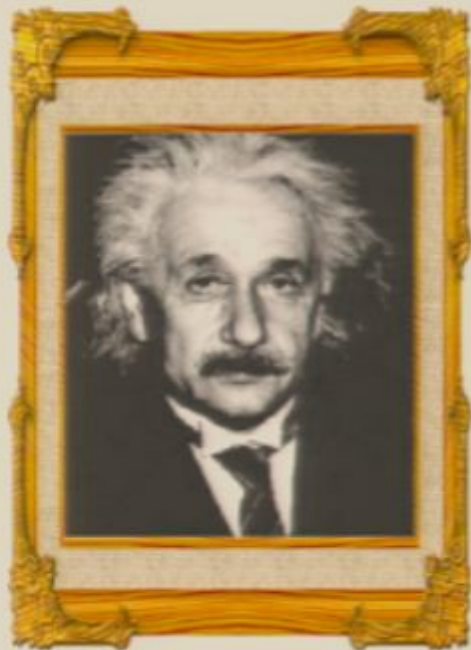
Matter tells light where to go.







Spacetime is not independent
of what is happening in it.

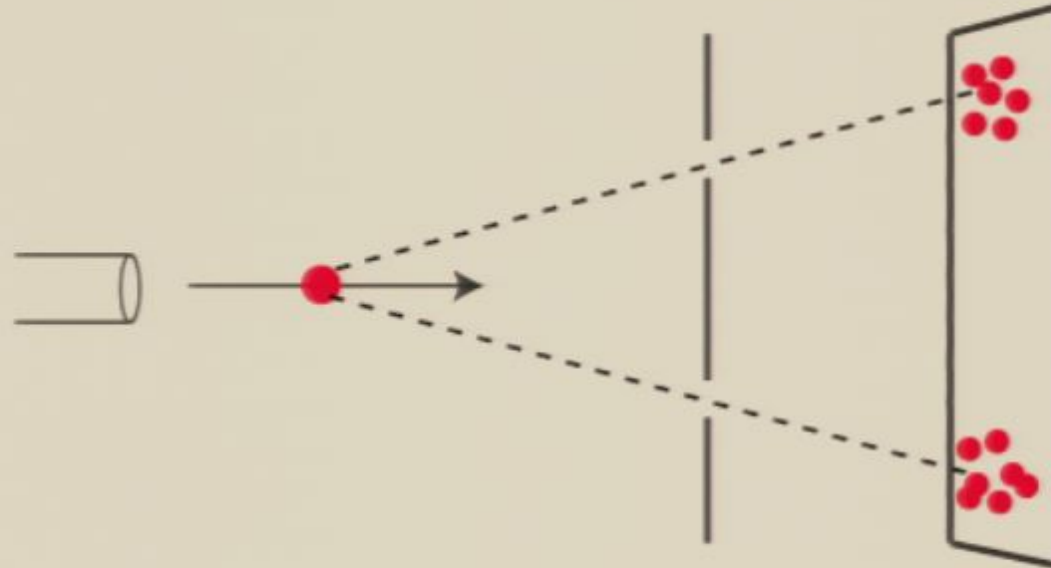


Matter curves spacetime and
spacetime tells matter where to go.

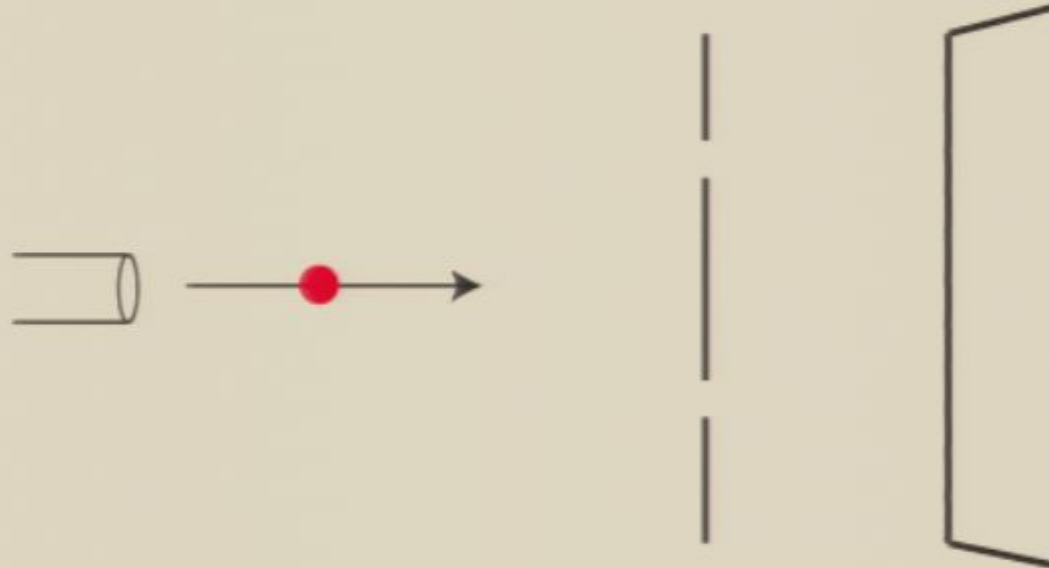
Matter



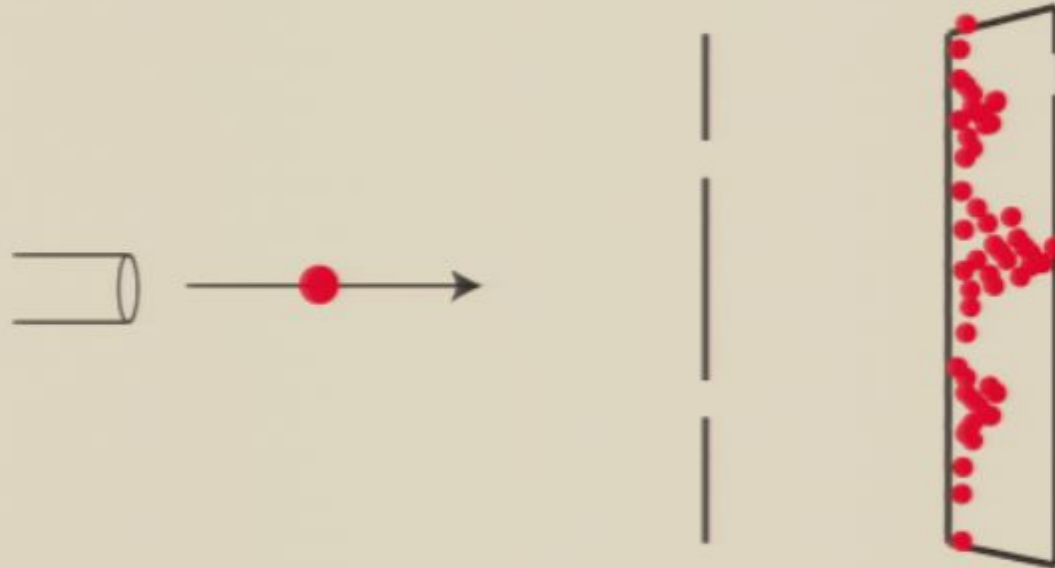




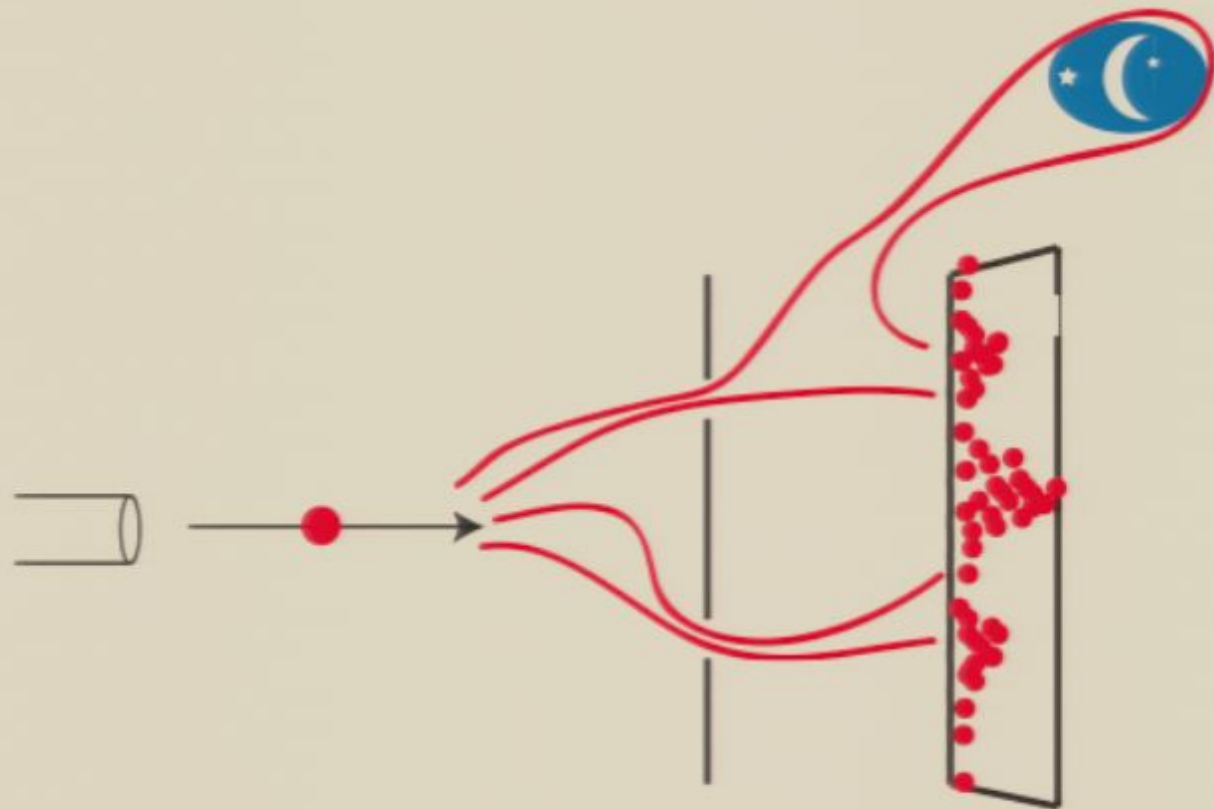
Repeat with a particle



Repeat with a particle







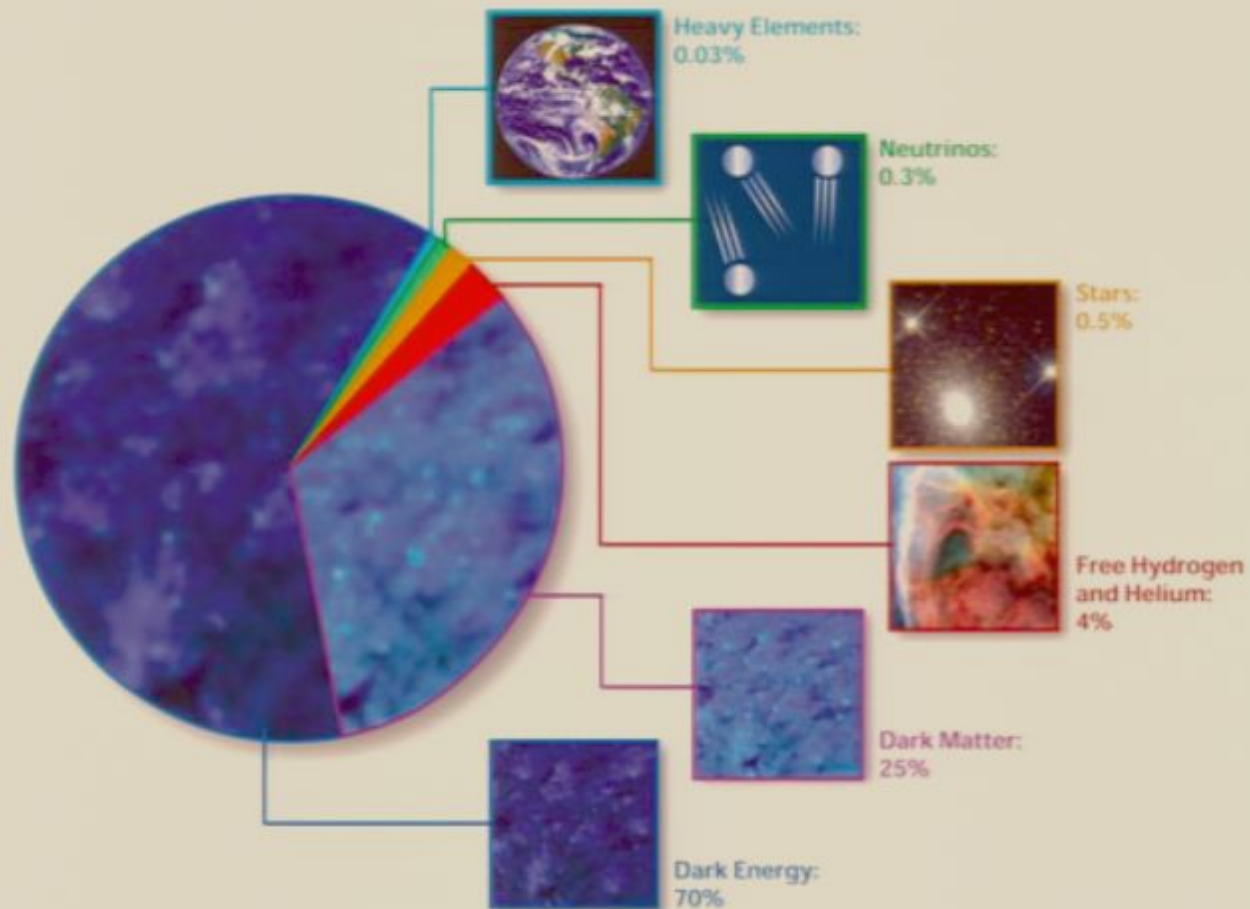
quantum matter + spacetime





and maybe everywhere?

COMPOSITION OF THE COSMOS



We need a

QUANTUM THEORY
OF GRAVITY

BE SIMPLE AND ELEGANT

BE MATHEMATICALLY RIGOROUS

TELL US IF THE UNIVERSE IS FINITE OR INFINITE

DESCRIBE THE ENTIRE UNIVERSE

DESCRIBE THE INTERIOR OF A BLACK HOLE

BE A UNIFIED THEORY OF EVERYTHING

EXPLAIN OBSERVATIONAL COSMOLOGY DATA

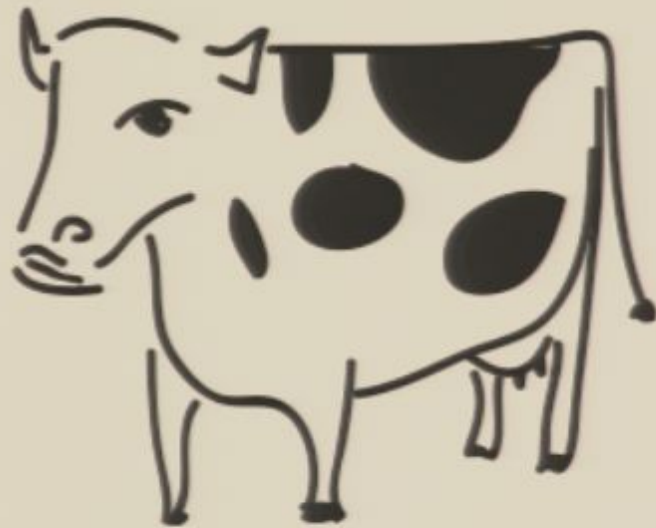
EXPLAIN DARK ENERGY AND DARK MATTER

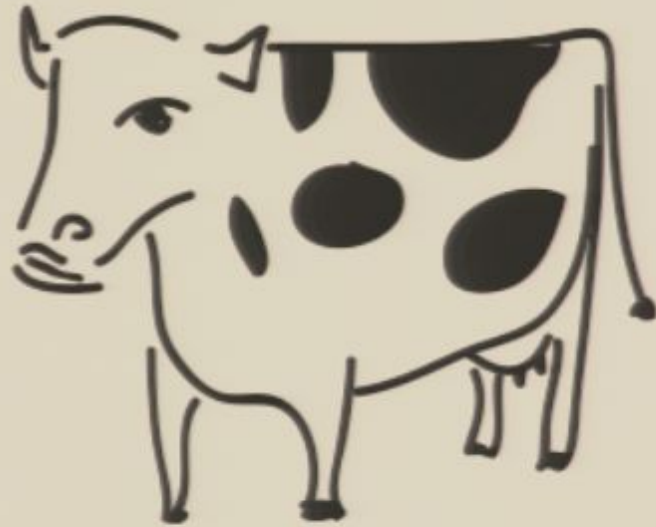
EXPLAIN THE NATURE OF TIME

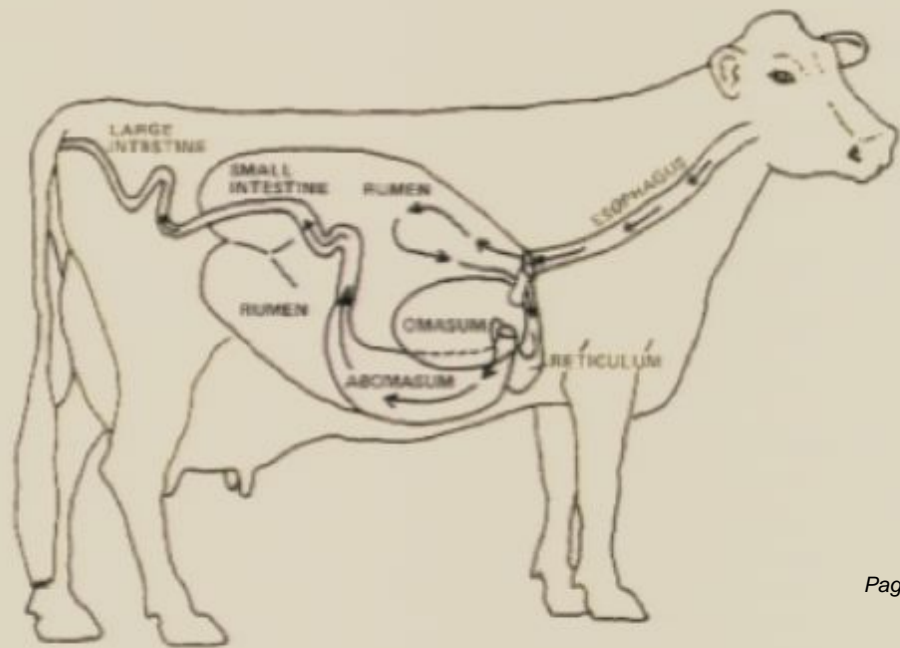
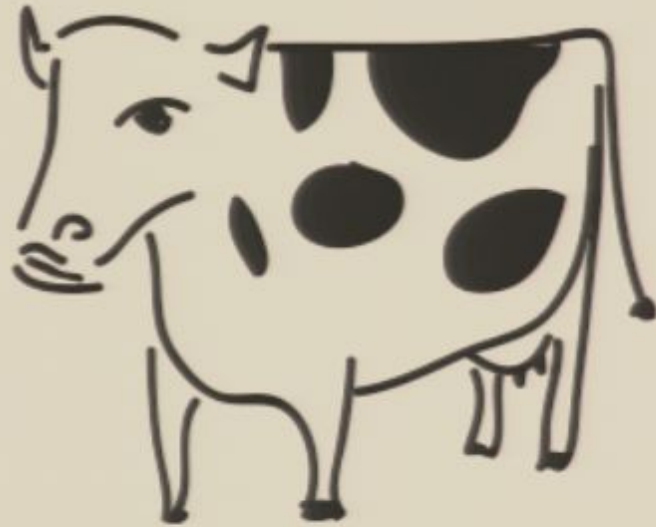
EXPLAIN QUANTUM THEORY

GO BEYOND GENERAL RELATIVITY

Be a physicist





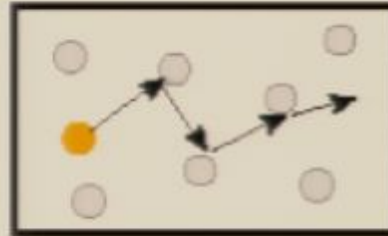




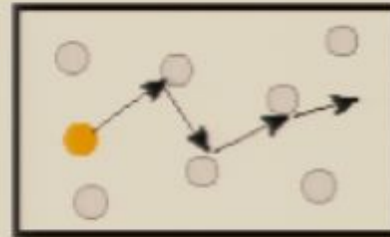
Are there
ATOMS of SPACETIME ?

What does that mean?
How do we test it?

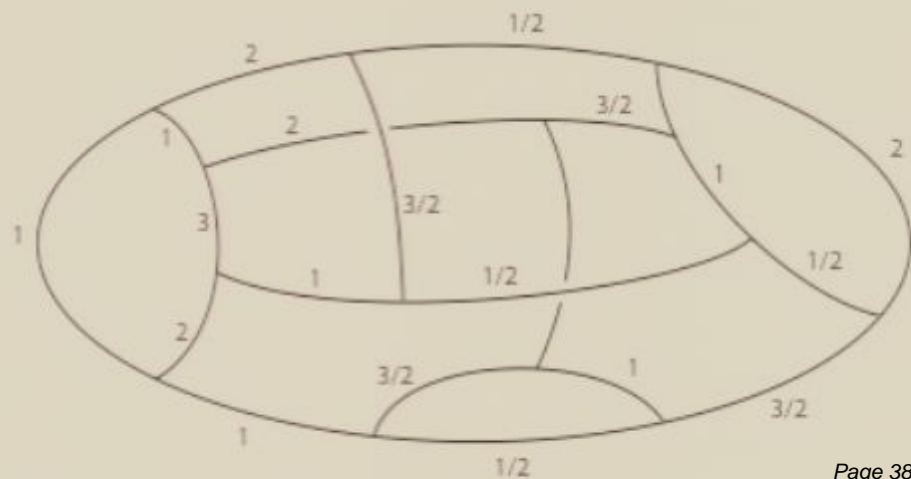
atoms of matter:



atoms of matter:

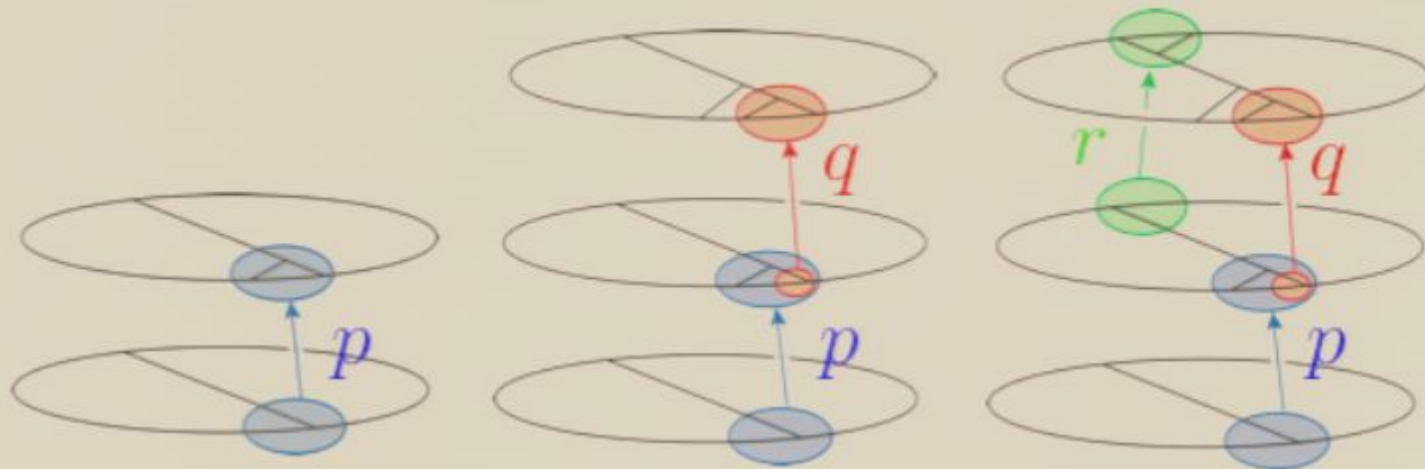


atoms of space:
spin networks



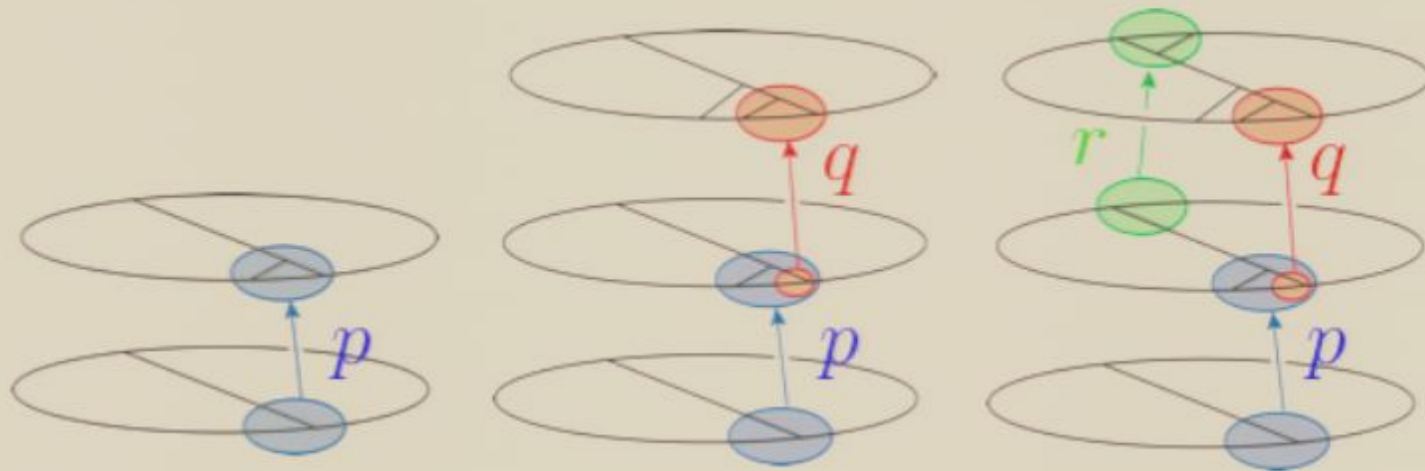
Atoms of time:

local changes of the network
are the fundamental events of the universe



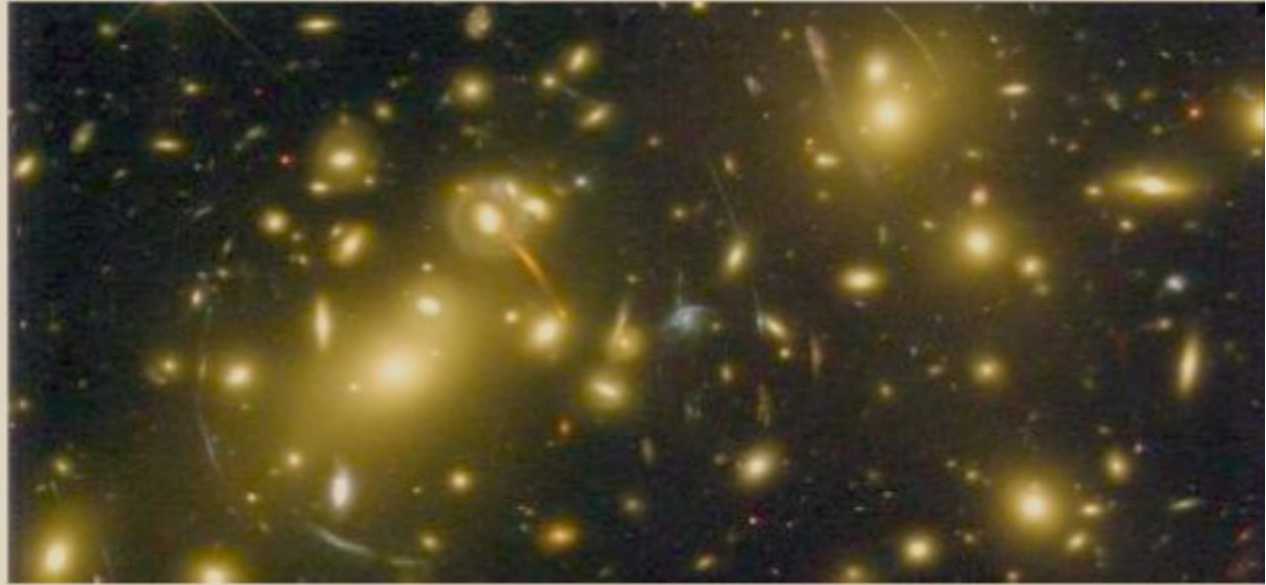
Atoms of time:

local changes of the network
are the fundamental events of the universe



Since we cannot see the details,
these changes we perceive as the flow of time.

This is space:



And this is a MODEL for atomic micro-space:



The purpose of
models is to
test them.

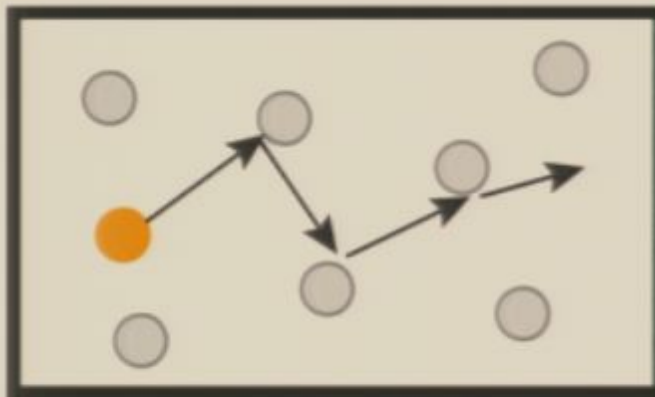
How to test for atoms of matter:

If matter is
continuous...



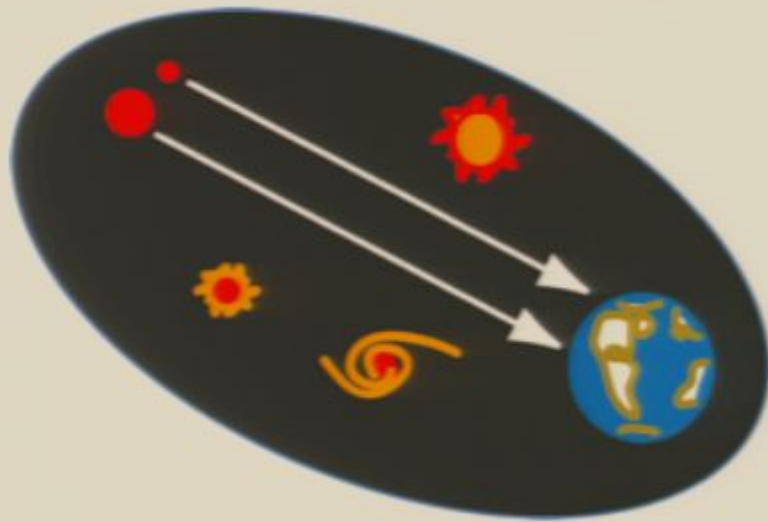
distance proportional to time

If matter is
made of
atoms...



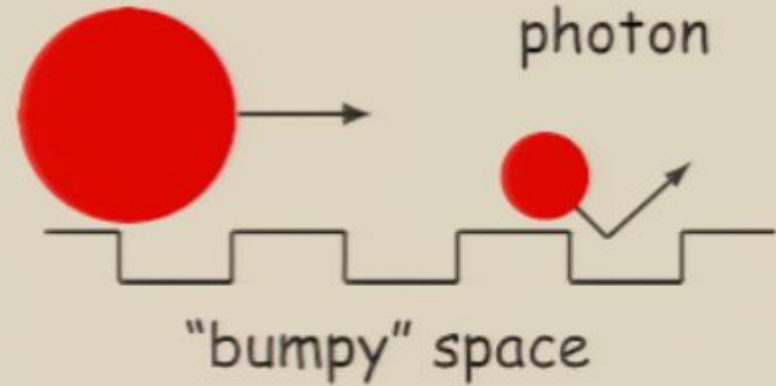
distance proportional to the square root of time

Ideas on how to test for atoms of space:

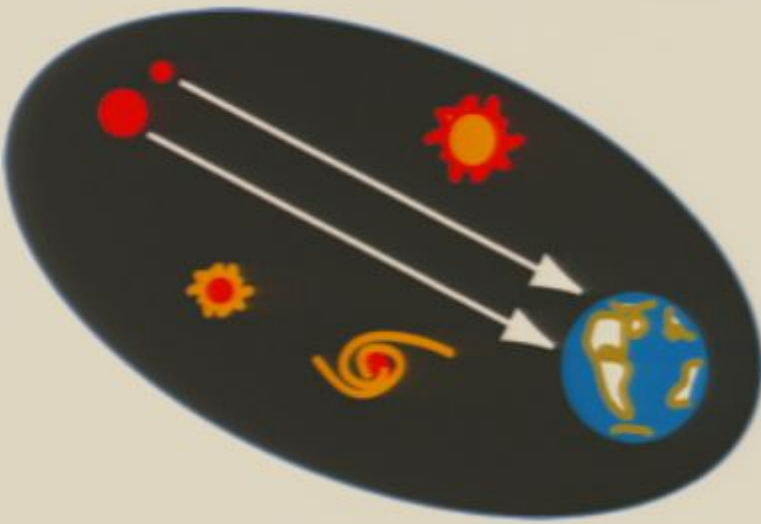


low energy
photon

high energy
photon

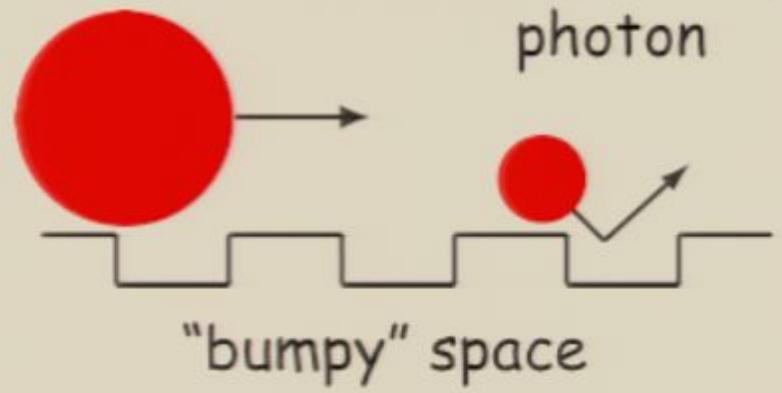


Ideas on how to test for atoms of space:

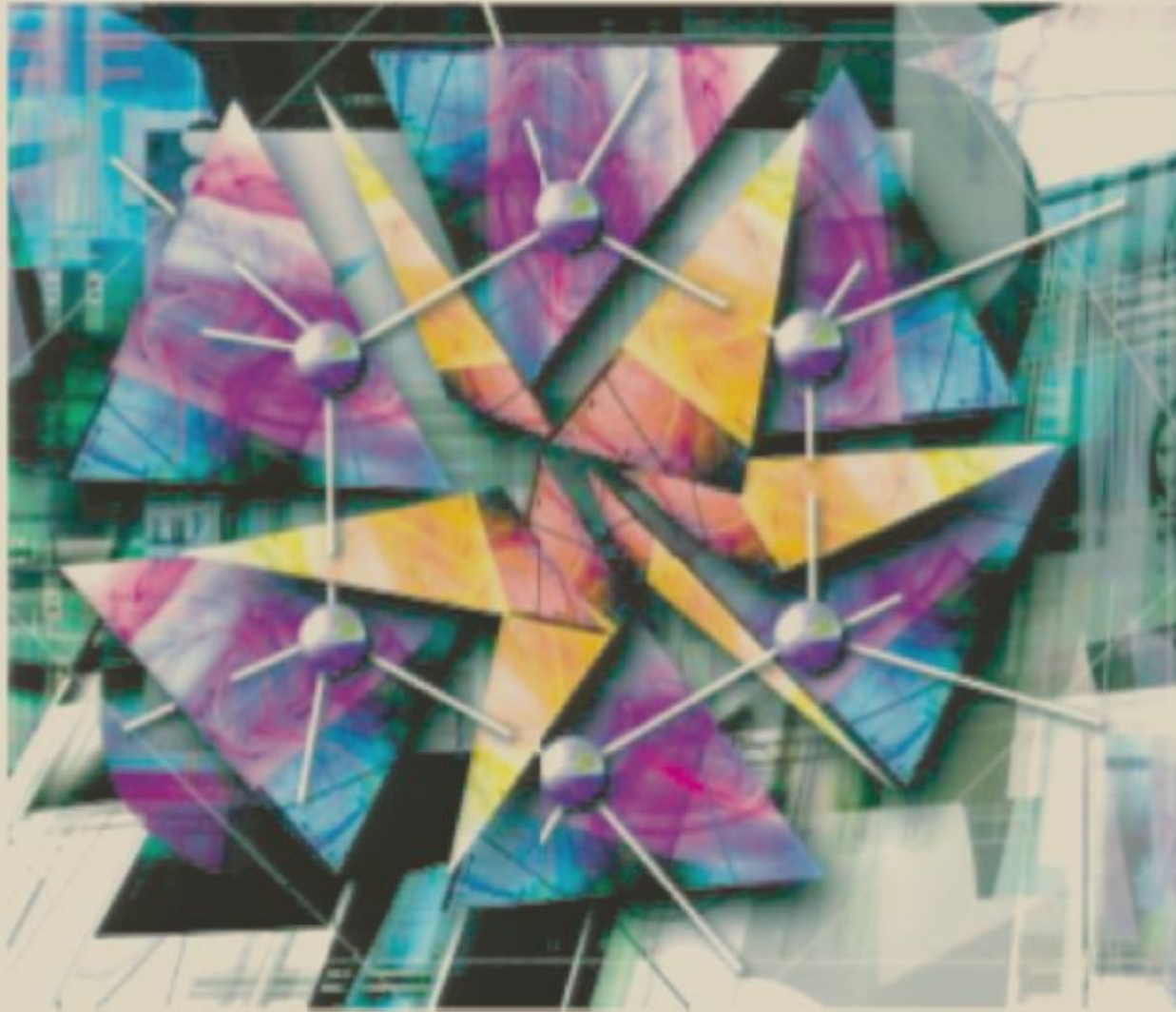


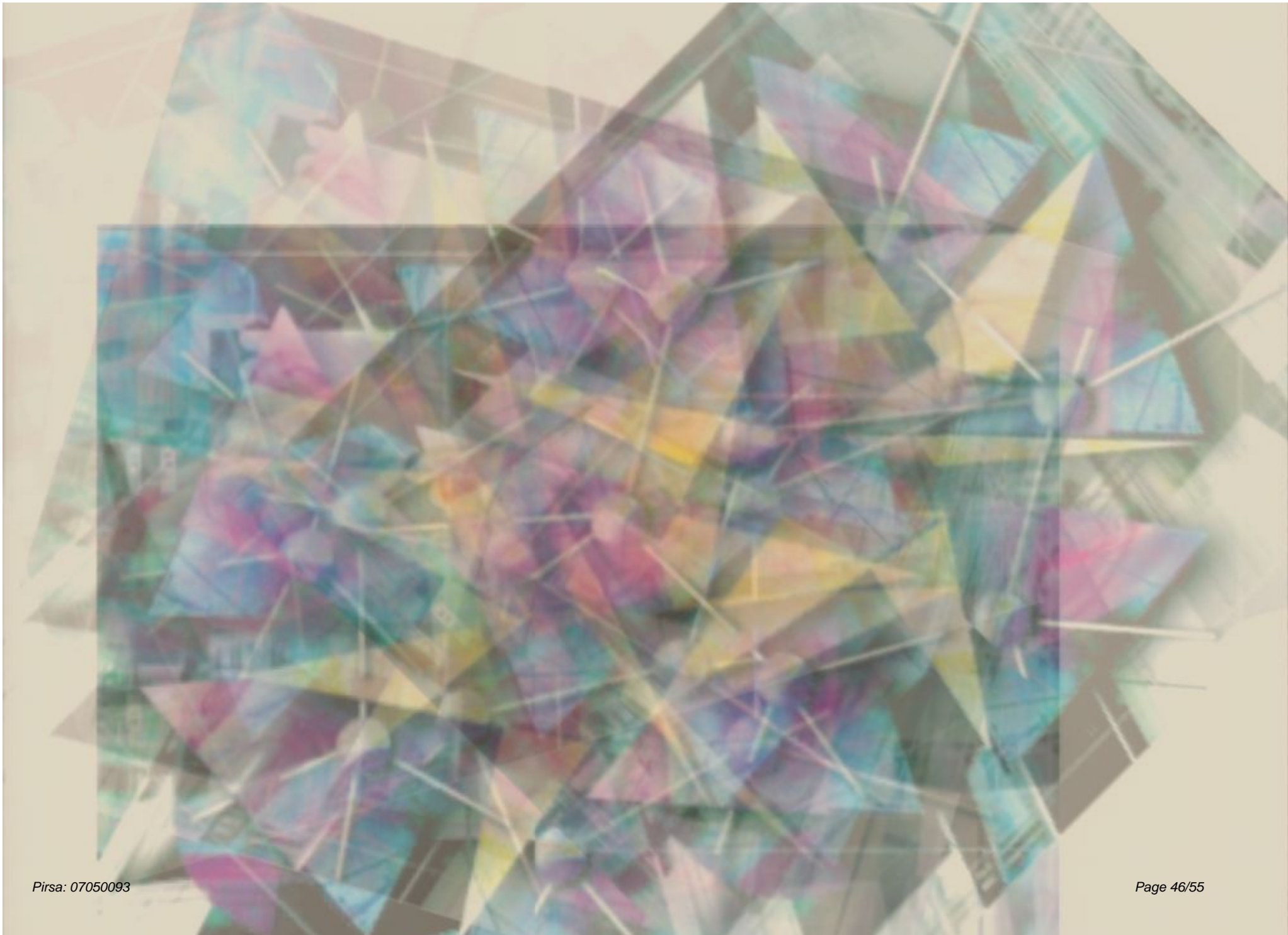
low energy
photon

high energy
photon



We may just about
be able to test
such bumpiness!





What is space?

THERE

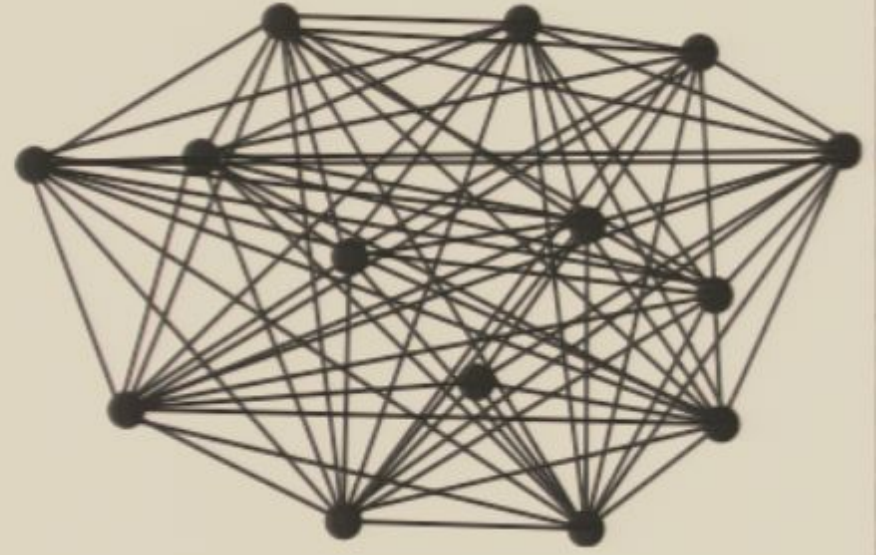


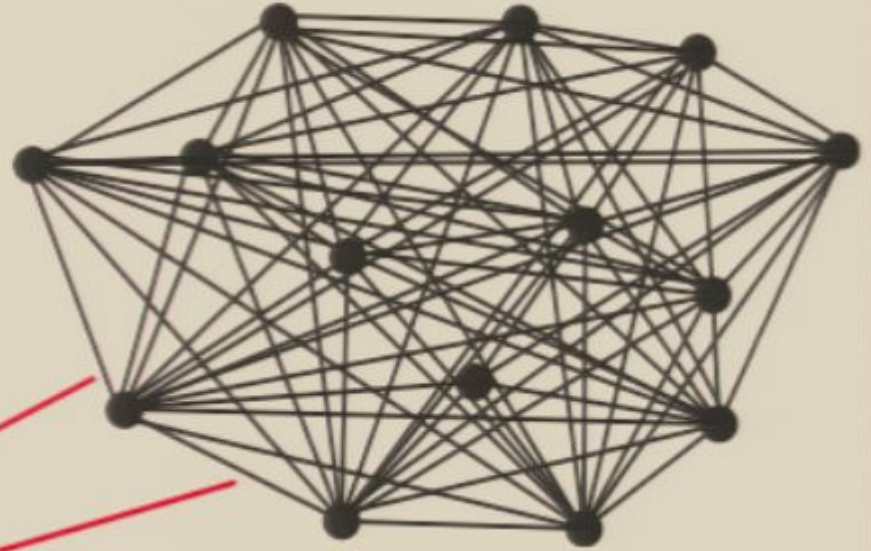
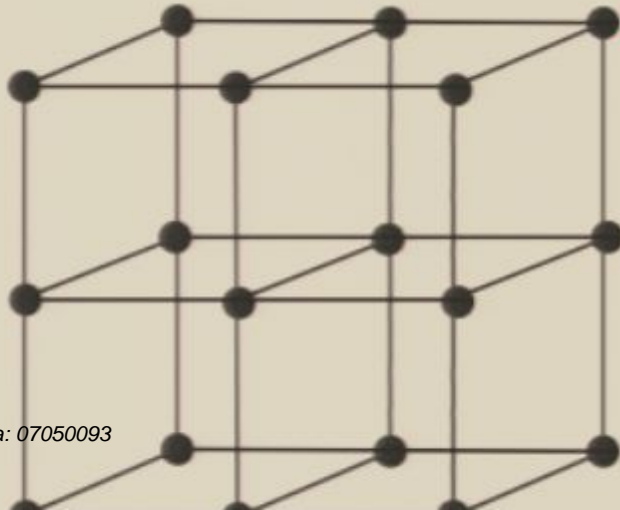
HERE



Locality

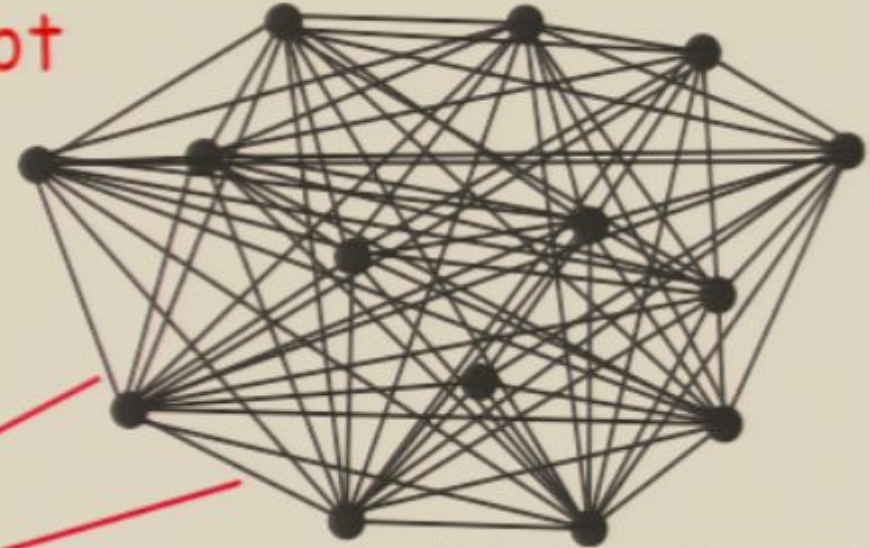




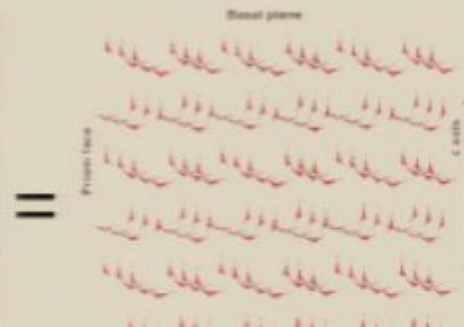
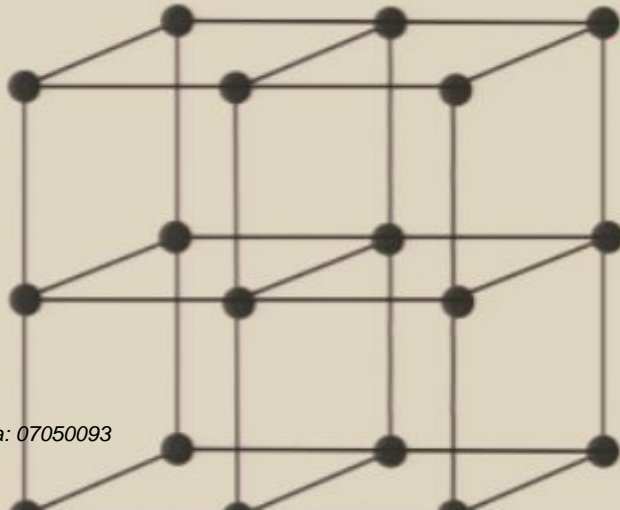


Space = Order

Hot

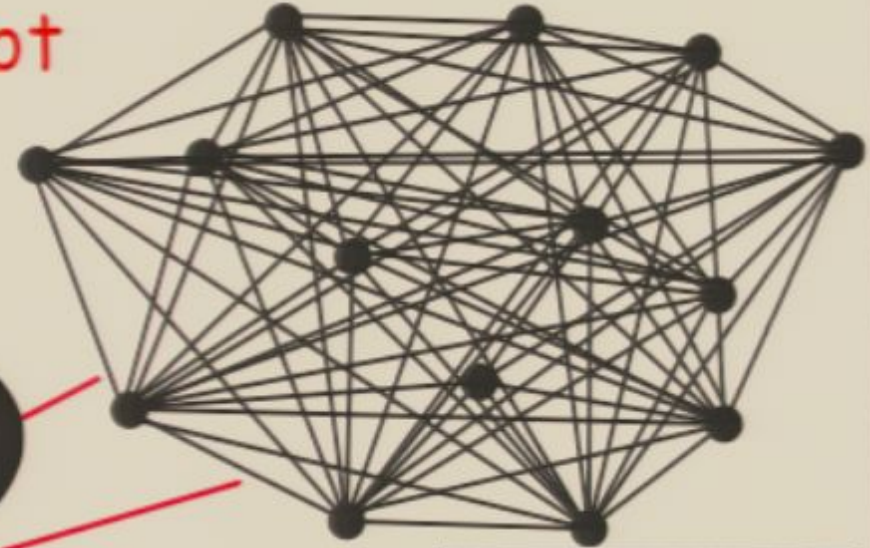


Cold=space

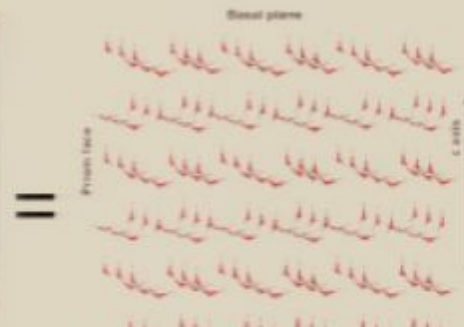
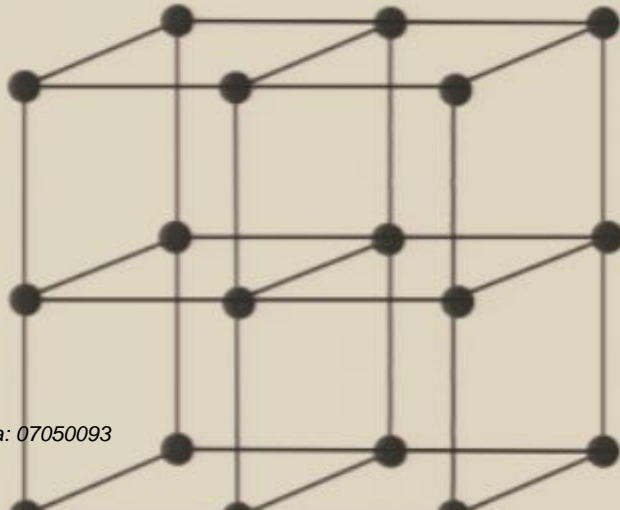


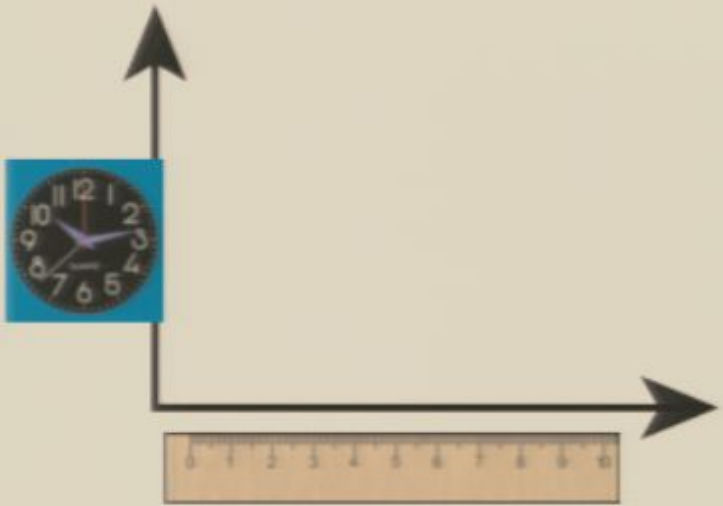
Space = Order

Hot

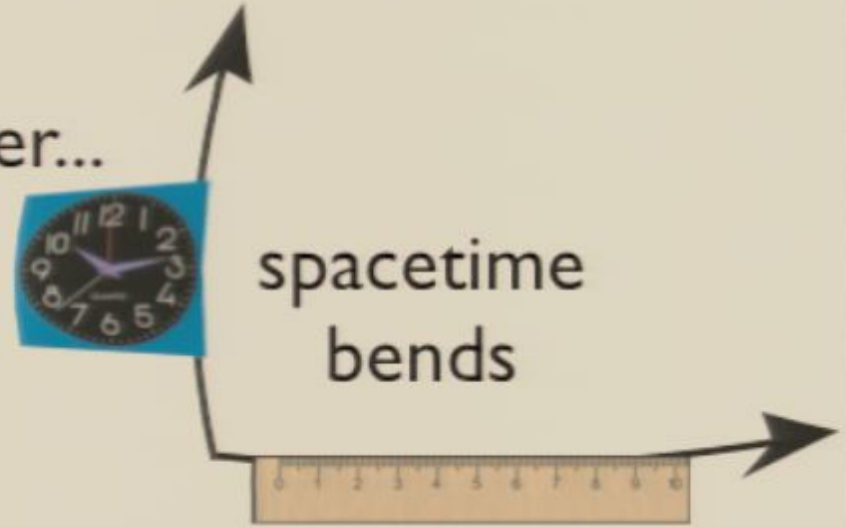


Cold=space



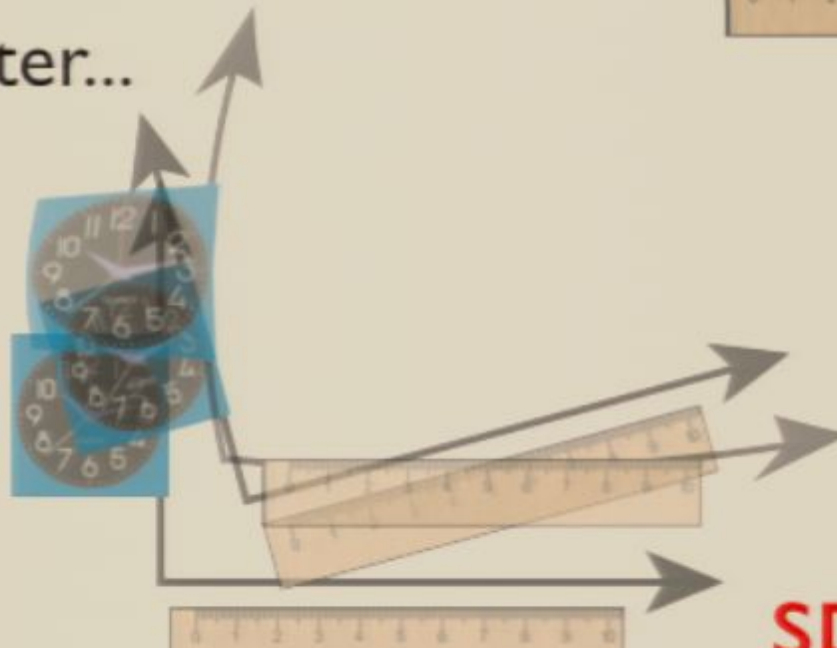


...with matter...



spacetime
bends

...with quantum matter...



what is
spacetime?

