Breaking nonlinear graviton with plabic graph

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Different approaches to Quantum Gravity

- String theory
- Loop quantum gravity
- Causal set approach
- Causal dynamical triangulation
- Twistor theory

Common issues

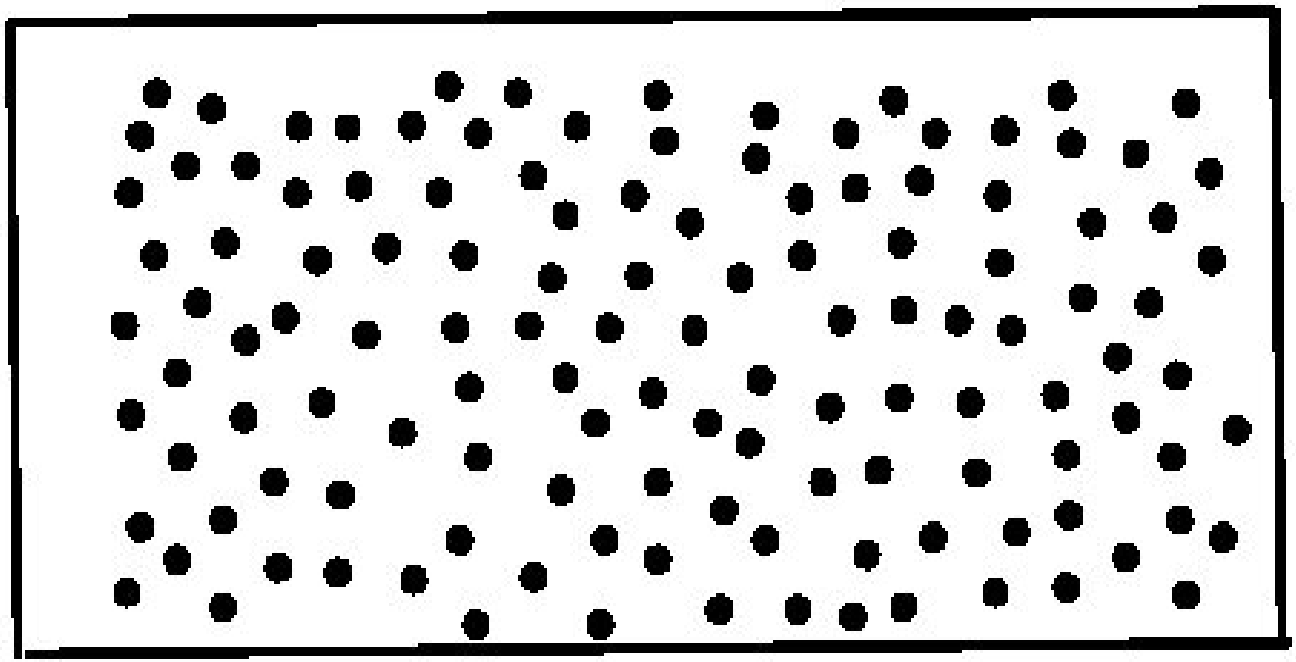
1. Nonlocality
2. Background independence
3. Dimensional reduction
4. Determinism/indeterminism
5. Dark energy

Alexander Grothendieck

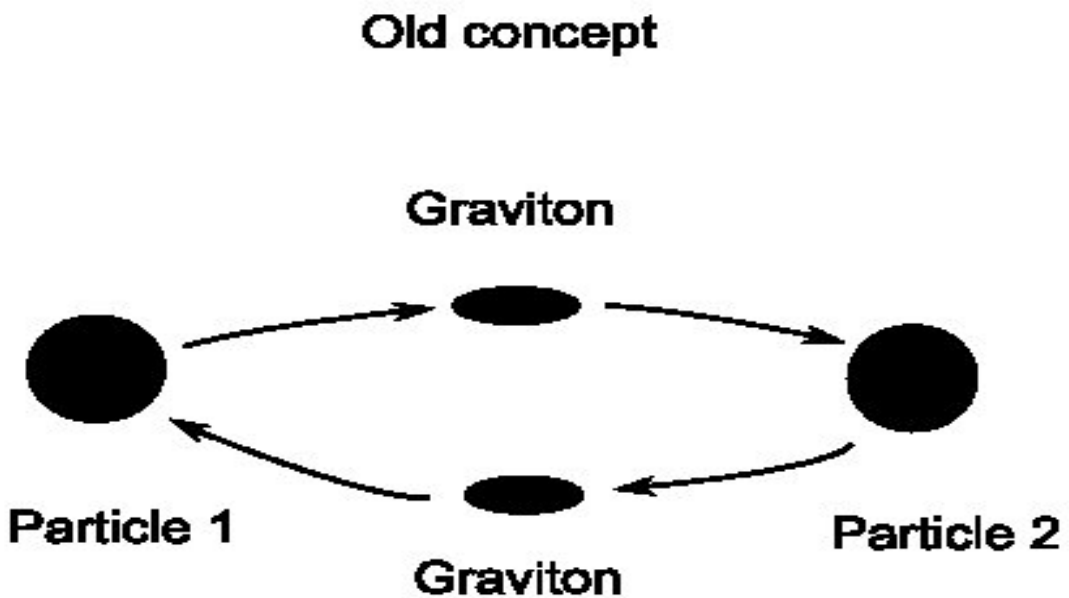
Plabic graph

A **plabic graph** is an undirected planar graph G, which we draw inside a **disk** (considered modulo homotopy) with n **boundary** vertices on the boundary of the disk, labelled $1, \ldots, n$ in clockwise order, as well as some coloured **internal** vertices. These internal vertices are strictly inside the disk and are each coloured either **black** or **white**. Each boundary vertex i in G is incident to a single edge. If a boundary vertex is adjacent to a leaf (vertex of degree 1), we refer to that leaf as a lollipop.

3-dimensional space

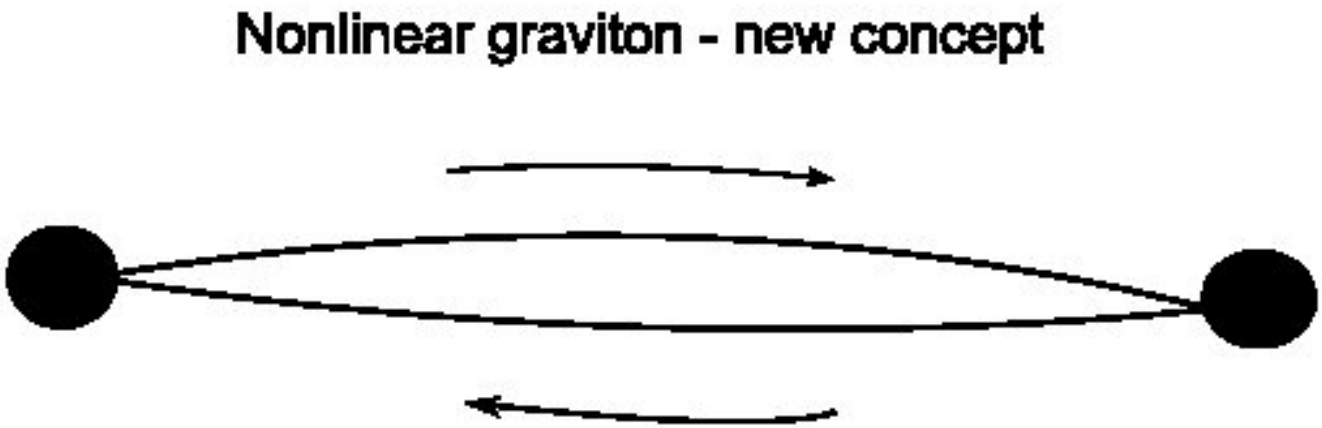


Old concept of graviton



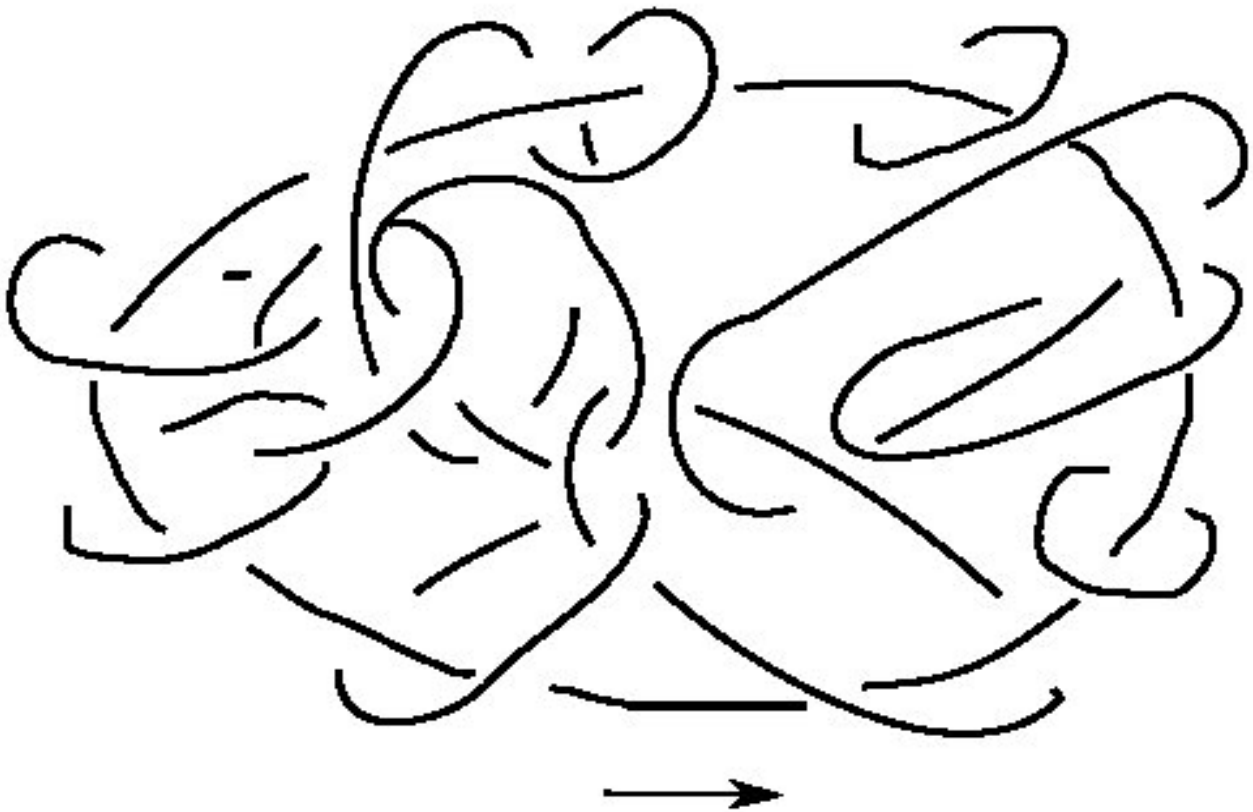
Nonlocal spring

Loop created in Planck time

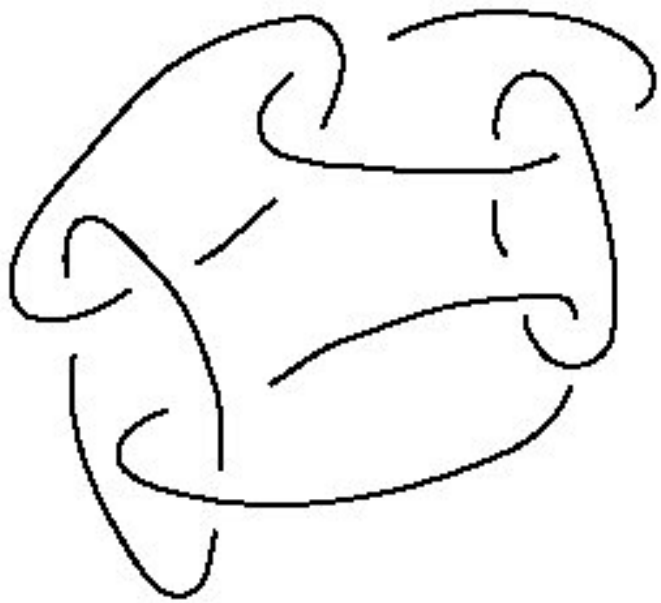


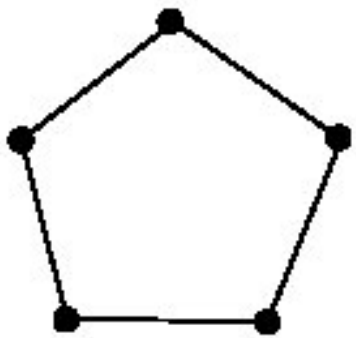
Non-locally created loop

Hopf-linked rings

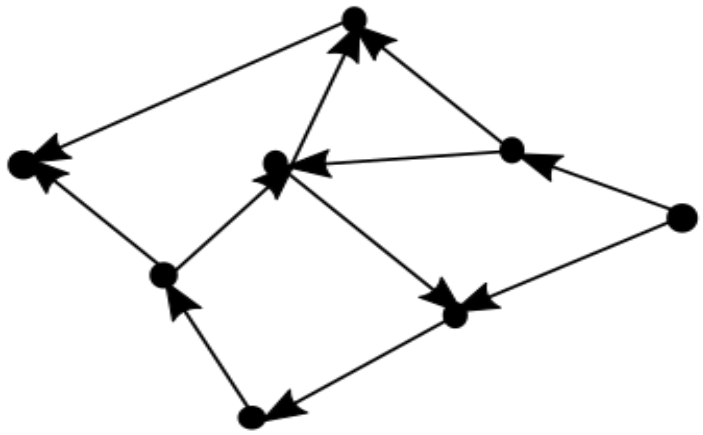


Hopf-linked rings and graphs

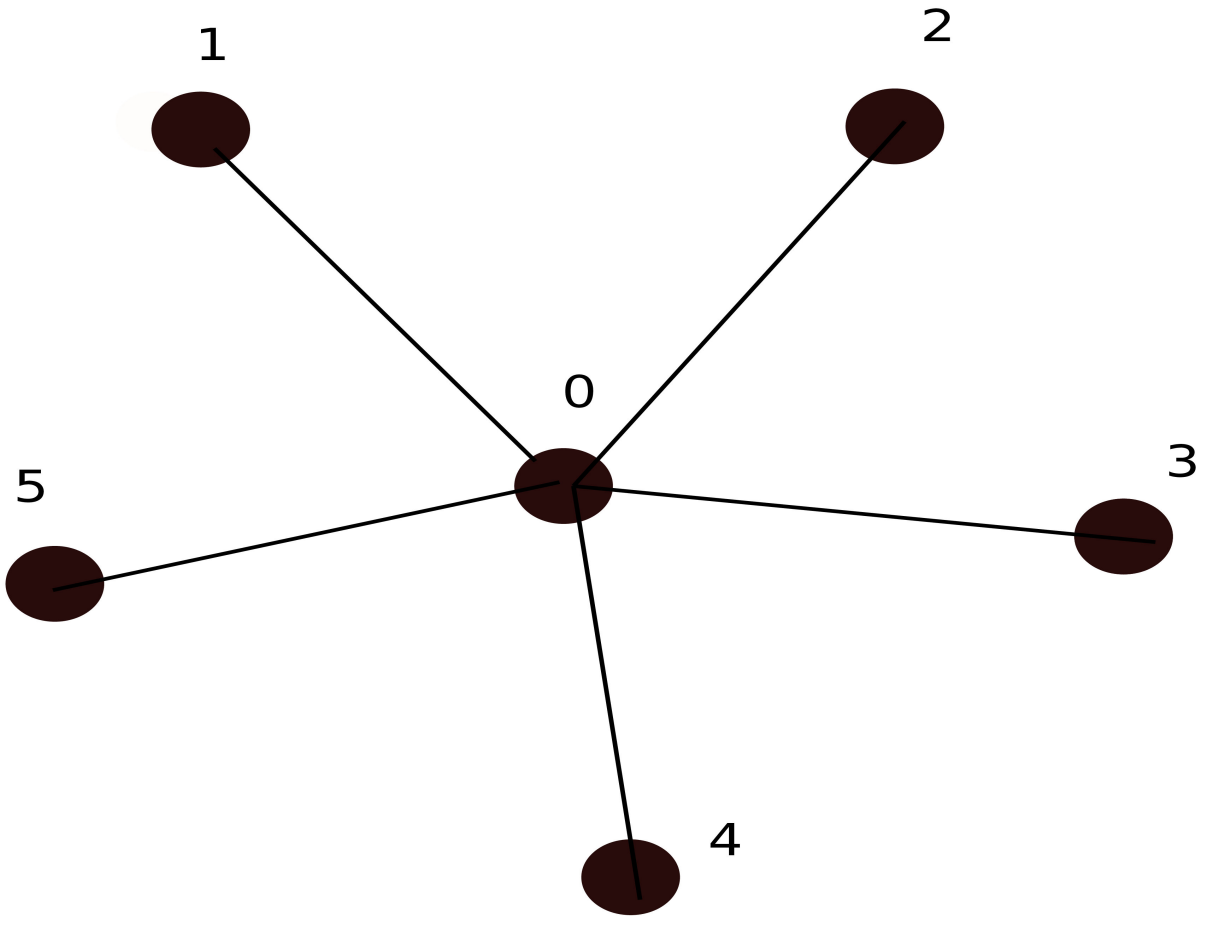




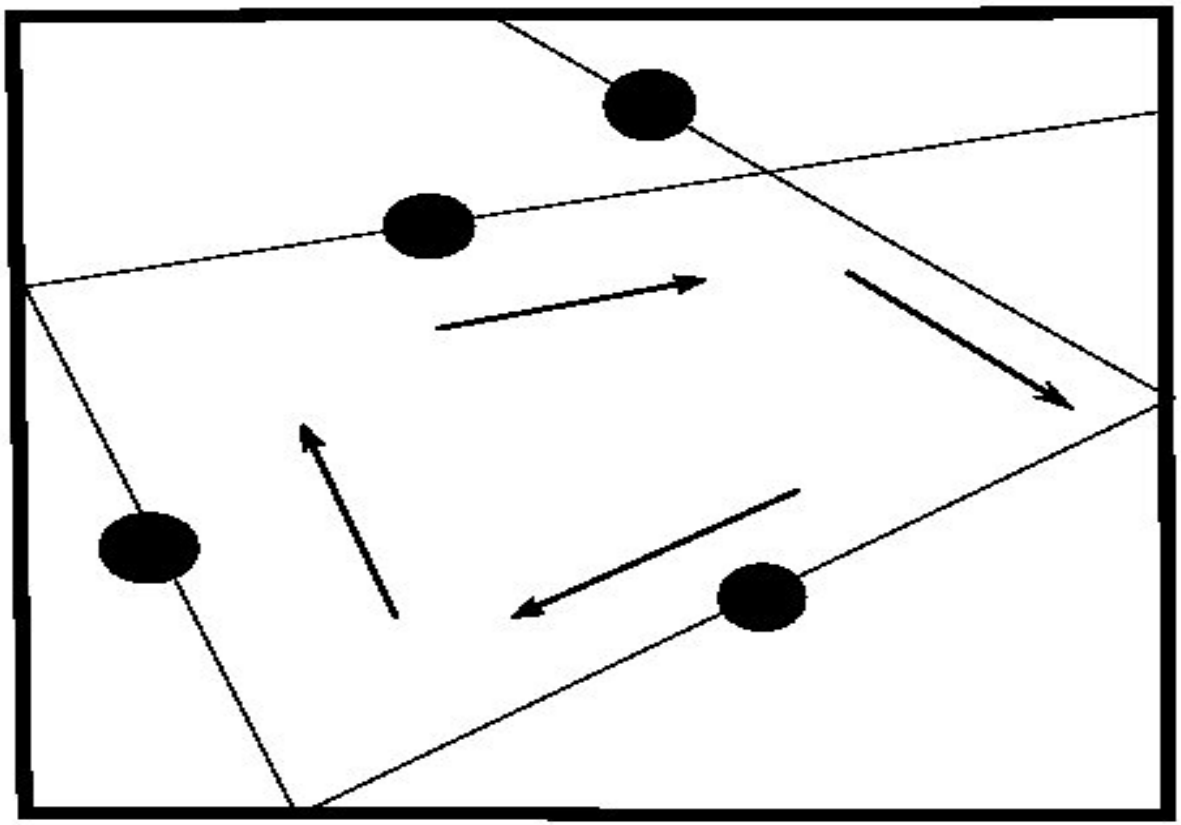
Oriented graphs



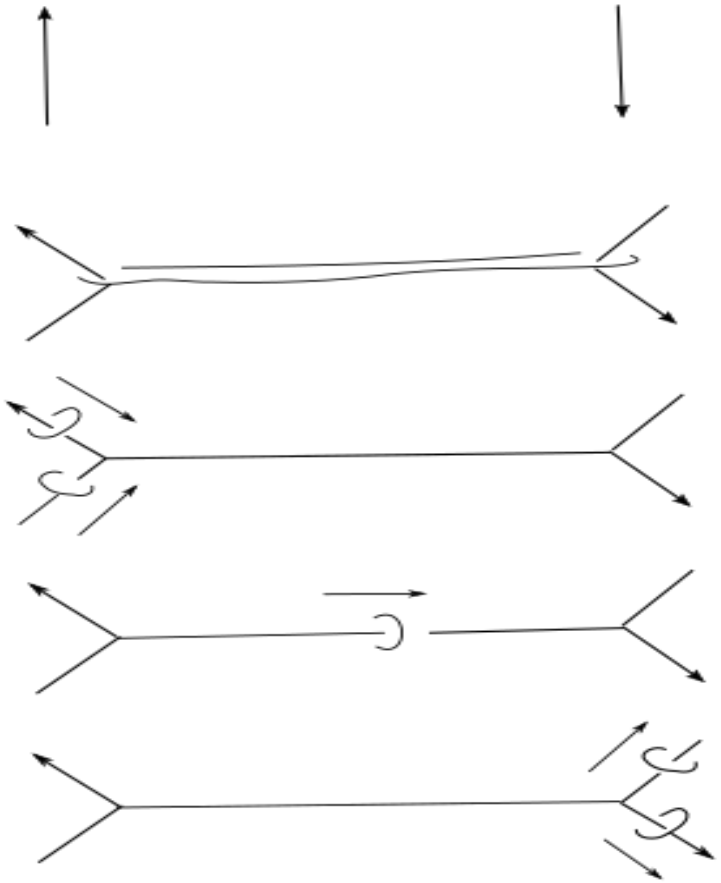
New mass



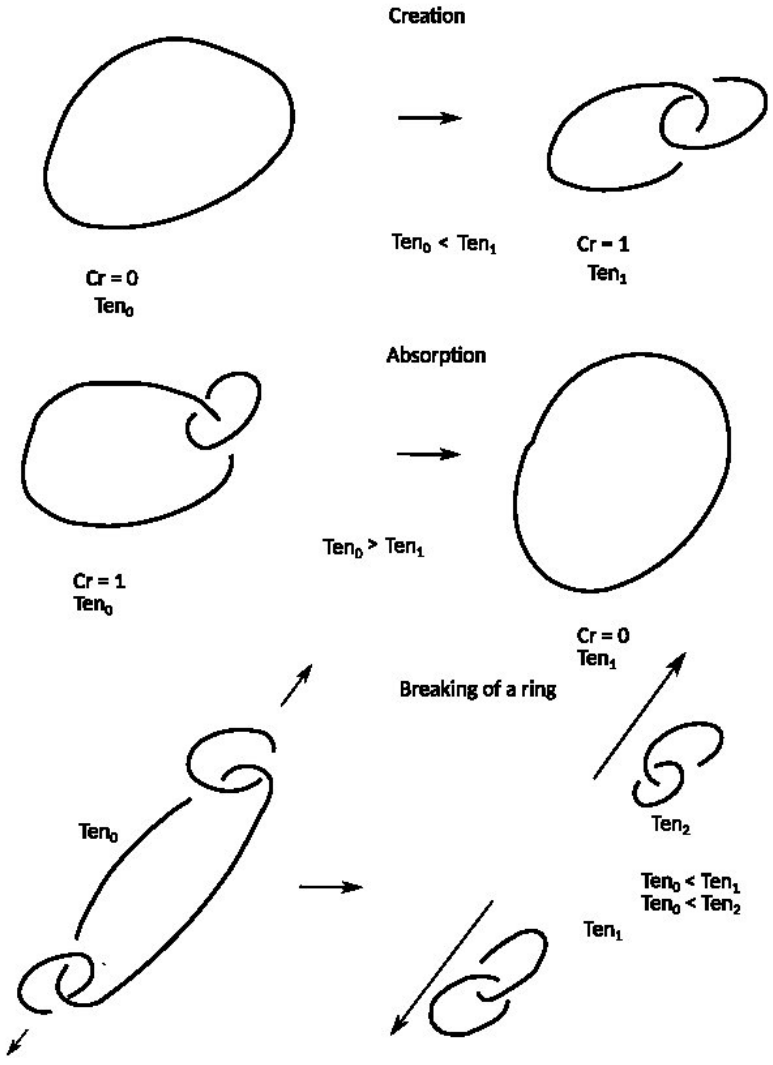
Particle knocked in a box



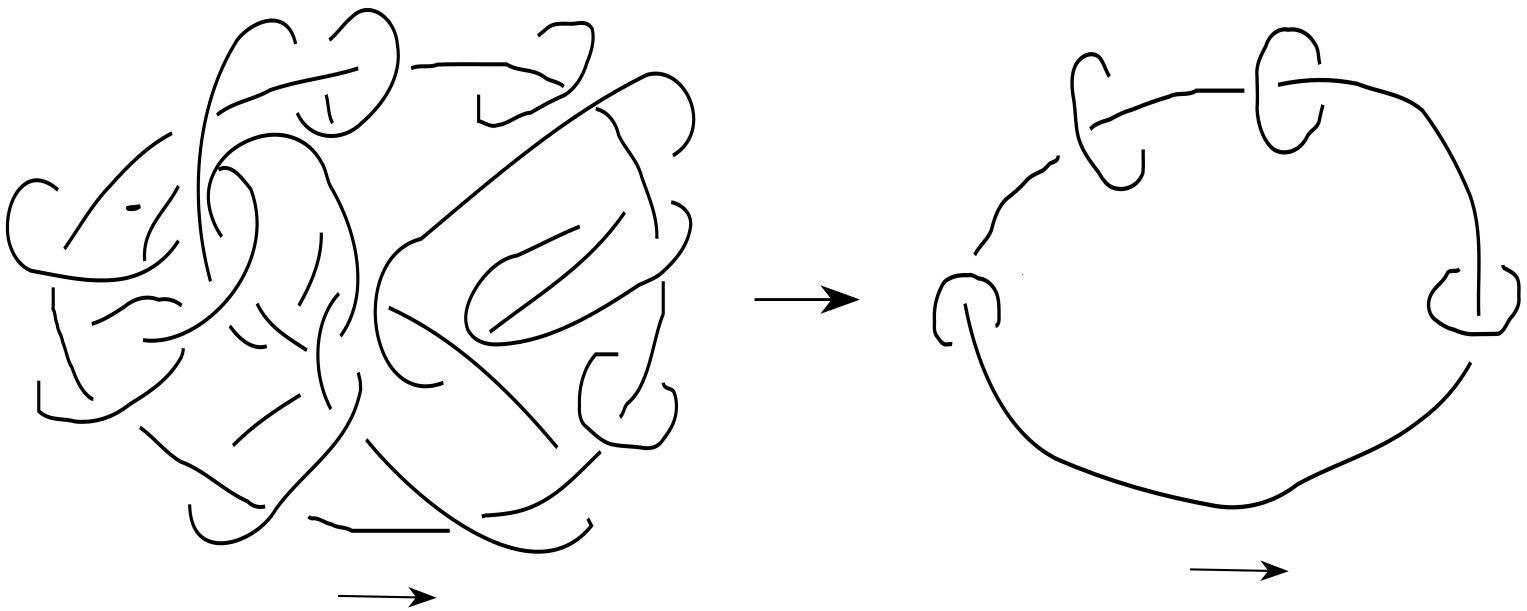
"Advanced version of Feynman diagram"



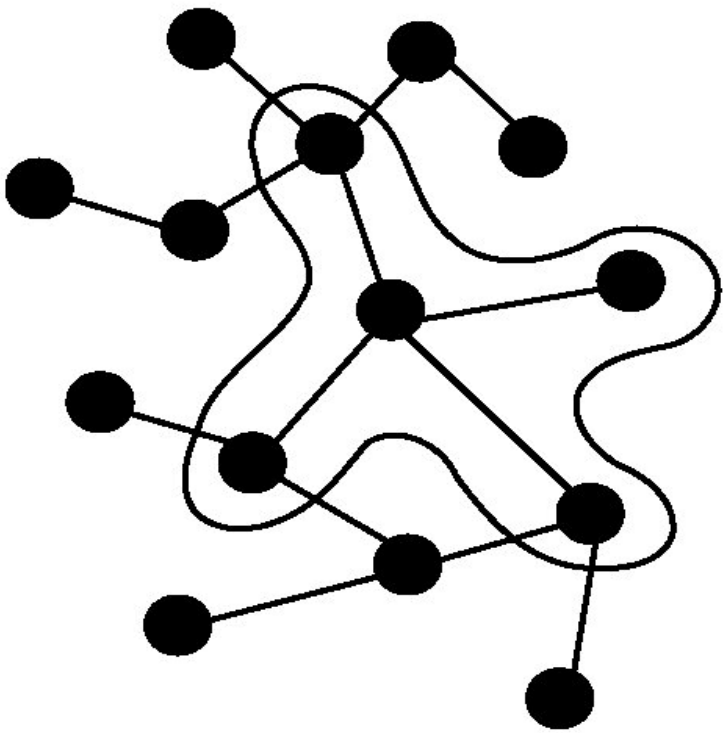
Creation, absorption and breaking of a ring.



Changing system of trajectories



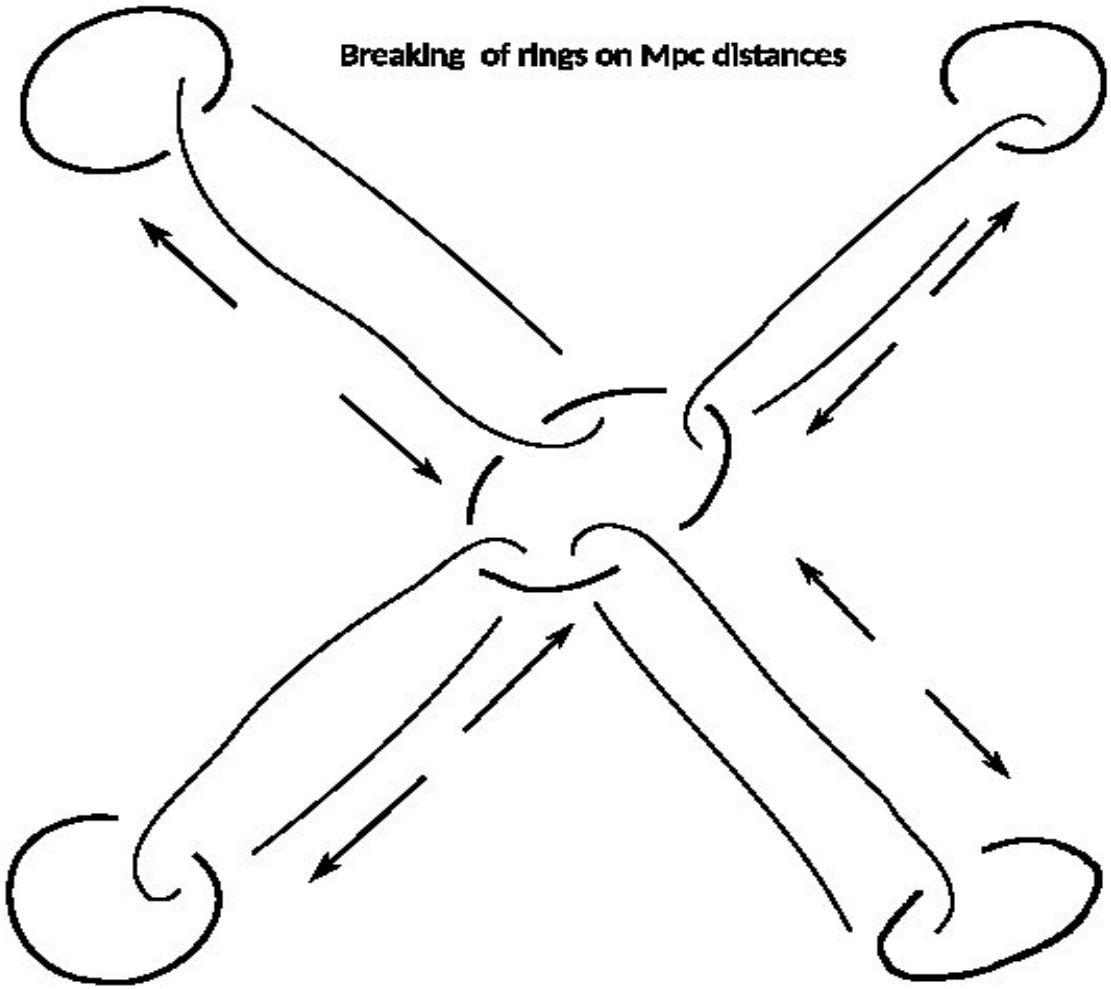
QFT on different set



Solution to common problems in quantum gravities

- nonlocality
- background independence
- dimensional reduction
- determinism
- dark energy
- arrow of time
- EPR paradox
- mathematical formulation of Feynman path integral

Dark energy



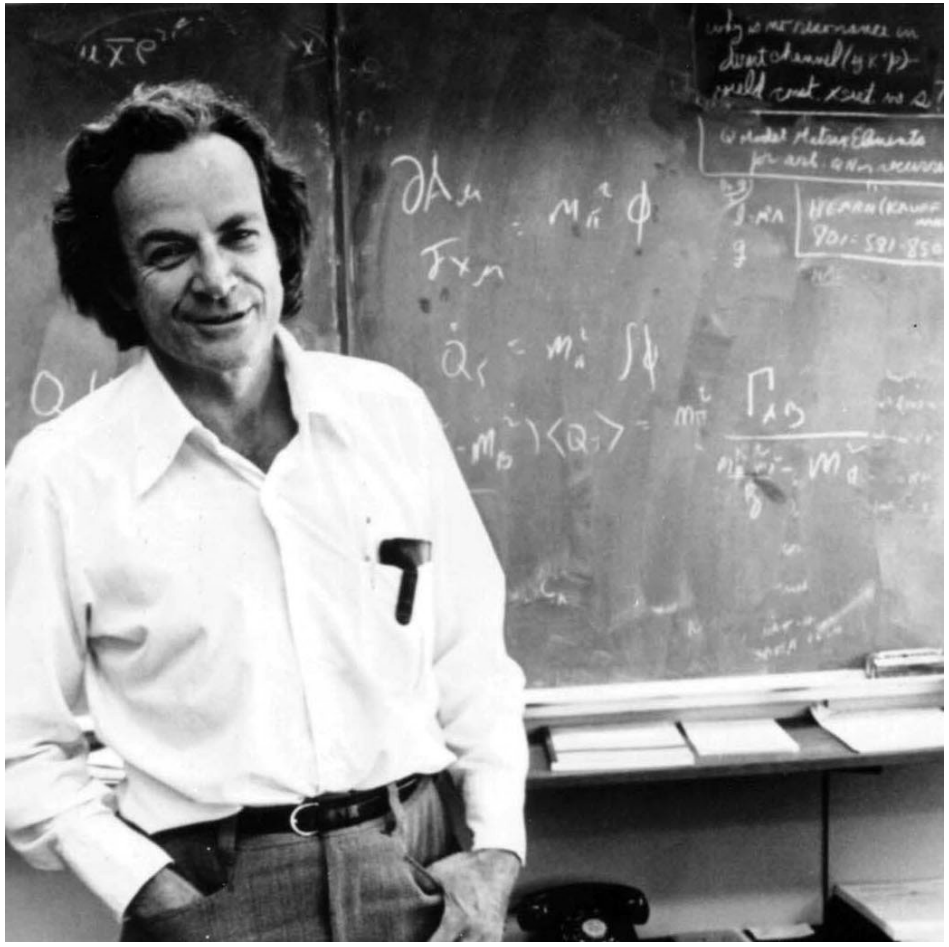
1. We claim that our paradigm could be made background independent. Is it partial background independence as in GR or could it be made fully background independent?
2. What is the origin of the first ring? Could it mean that we really should prefer bouncing-type of models in cosmology, or we should consider just one vibrating ring at the beginning?

1. QM is formulated in the language of probabilities, but GR is a geometrical theory. So, how we get rid of the probabilistic picture of QM in detail?
2. It follows from RP that the construction is highly non-local. The rings could be possibly created throughout the whole Universe. What is really the extent of this non-locality?
3. GR is defined in 4 - dimensional spacetime. What are the details of the limit to GR and QM?

1. How could be this theory constructed variationally?
2. The most important question is connected with string theory. What knowledges from string theory could we use for building the physical apparatus of RP? There is a vibrating ring traveling around some other ring. Could we really identify the vibrating ring with closed string in string theory? Author will leave the answer to other work.

Špejbl a Hurvínek

It doesn't matter how beautiful your theory is, it doesn't matter how smart you are or what your name is. If it doesn't agree with an experiment, it is wrong.



Thank You!

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Pictures of scientists were taken from web.