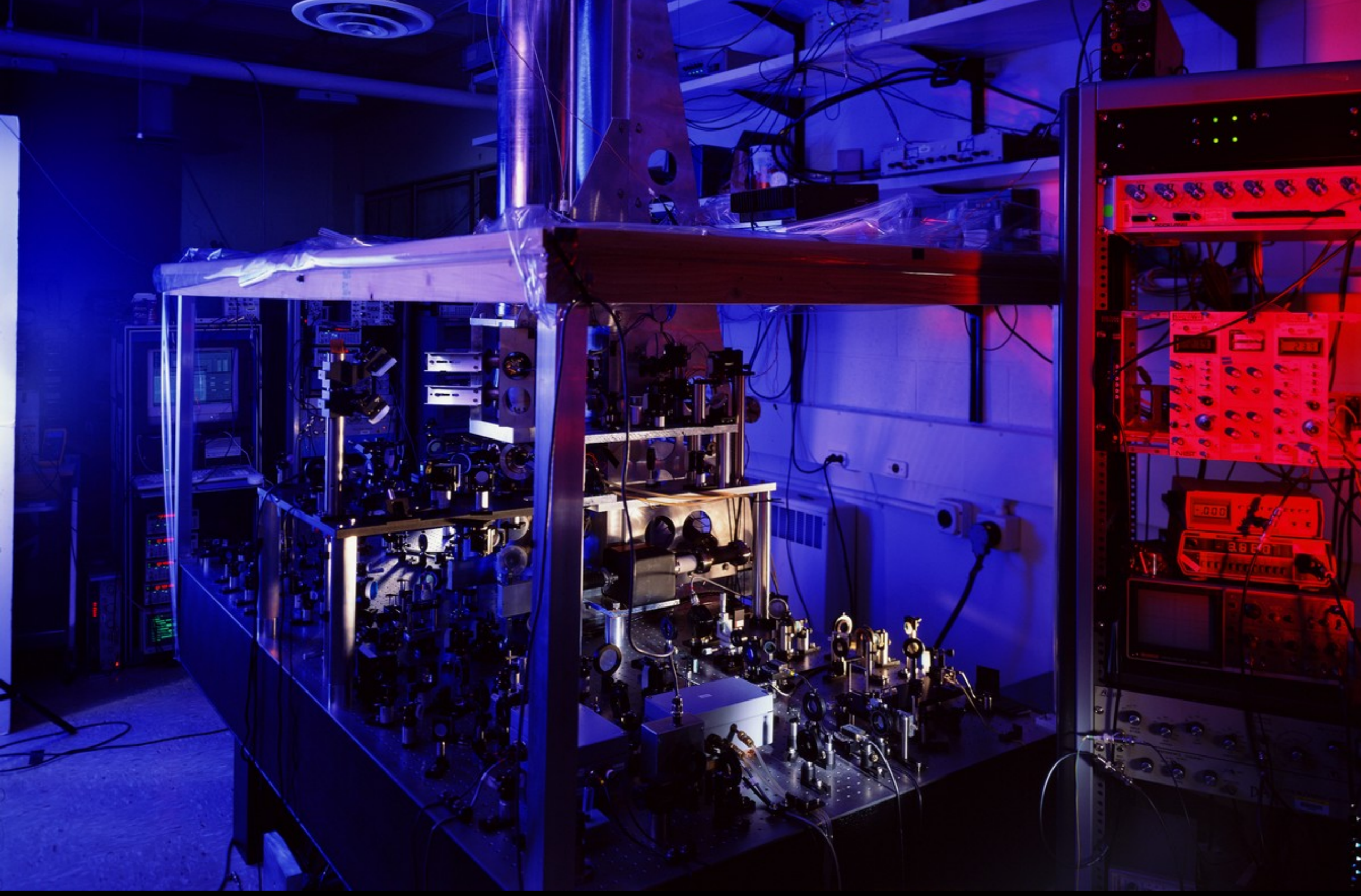

Cafe des Marguerites

Zakopane

Warszawa



Time is a stratified notion

- “Flows”
- There are traces of the past, not future
- Past is different from future
- Time is unique
- The present is all over the universe
- All evolve “in time”
- Events happen.

I. Time looses pieces

II. The world without time

III. Recovering time, layer by layer

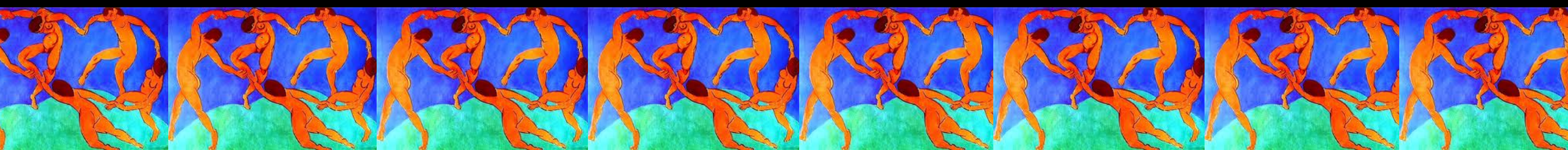
I. Time looses pieces

Zakopane

Warszawa

There is no single great clock that tics away the life of the cosmos

Everybody dances at his own rhythm



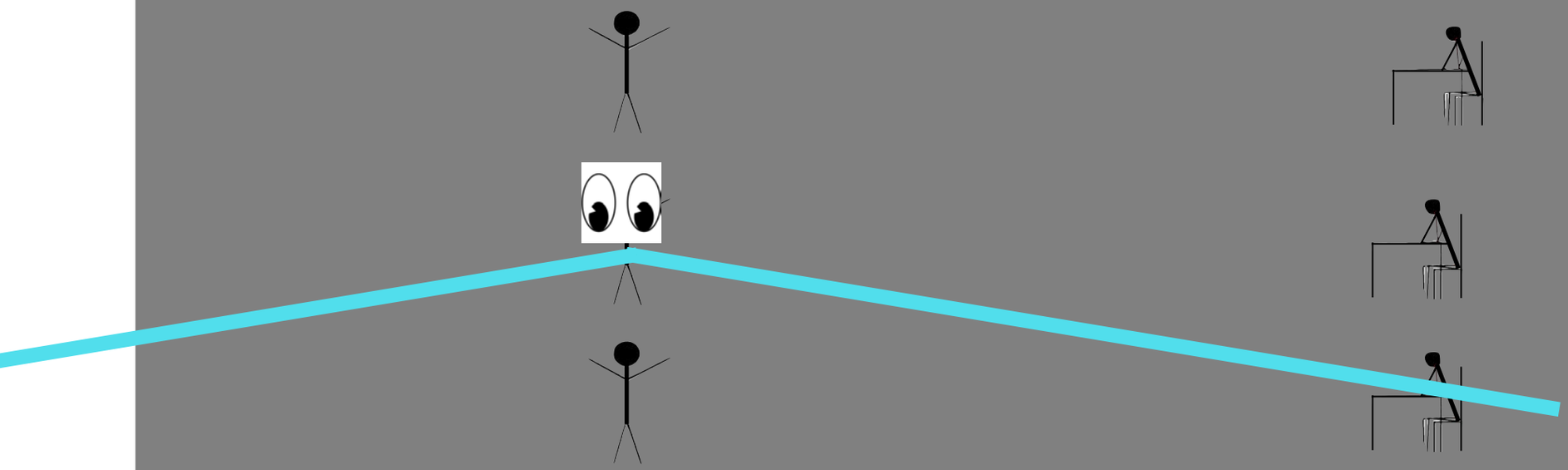
1 μs

10 billions years!

White hole

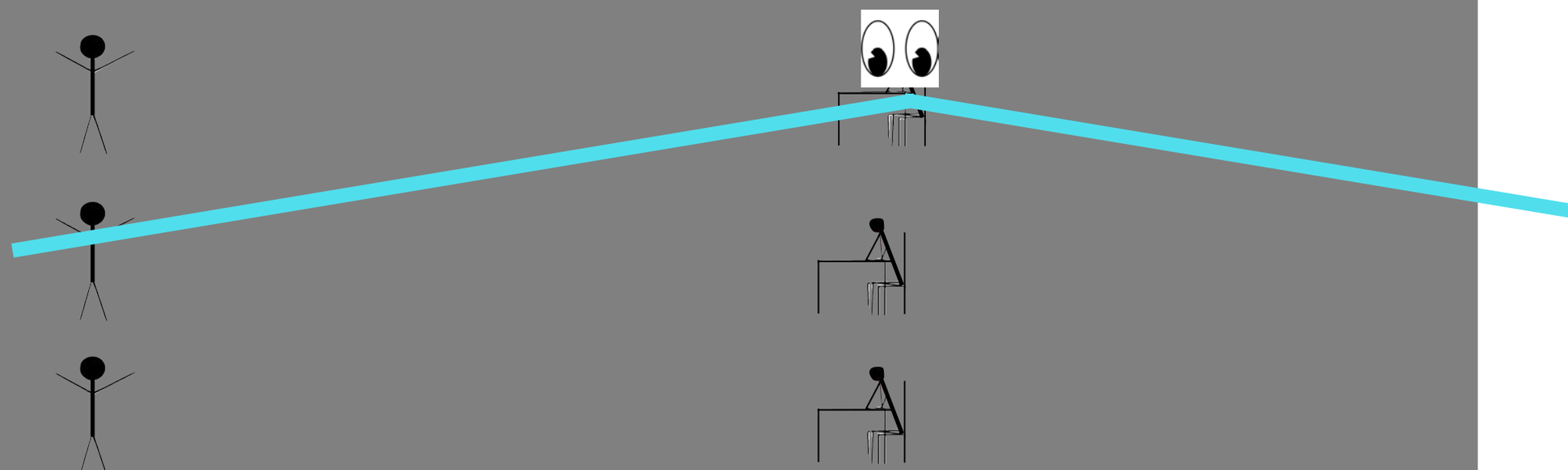
Black hole

Future



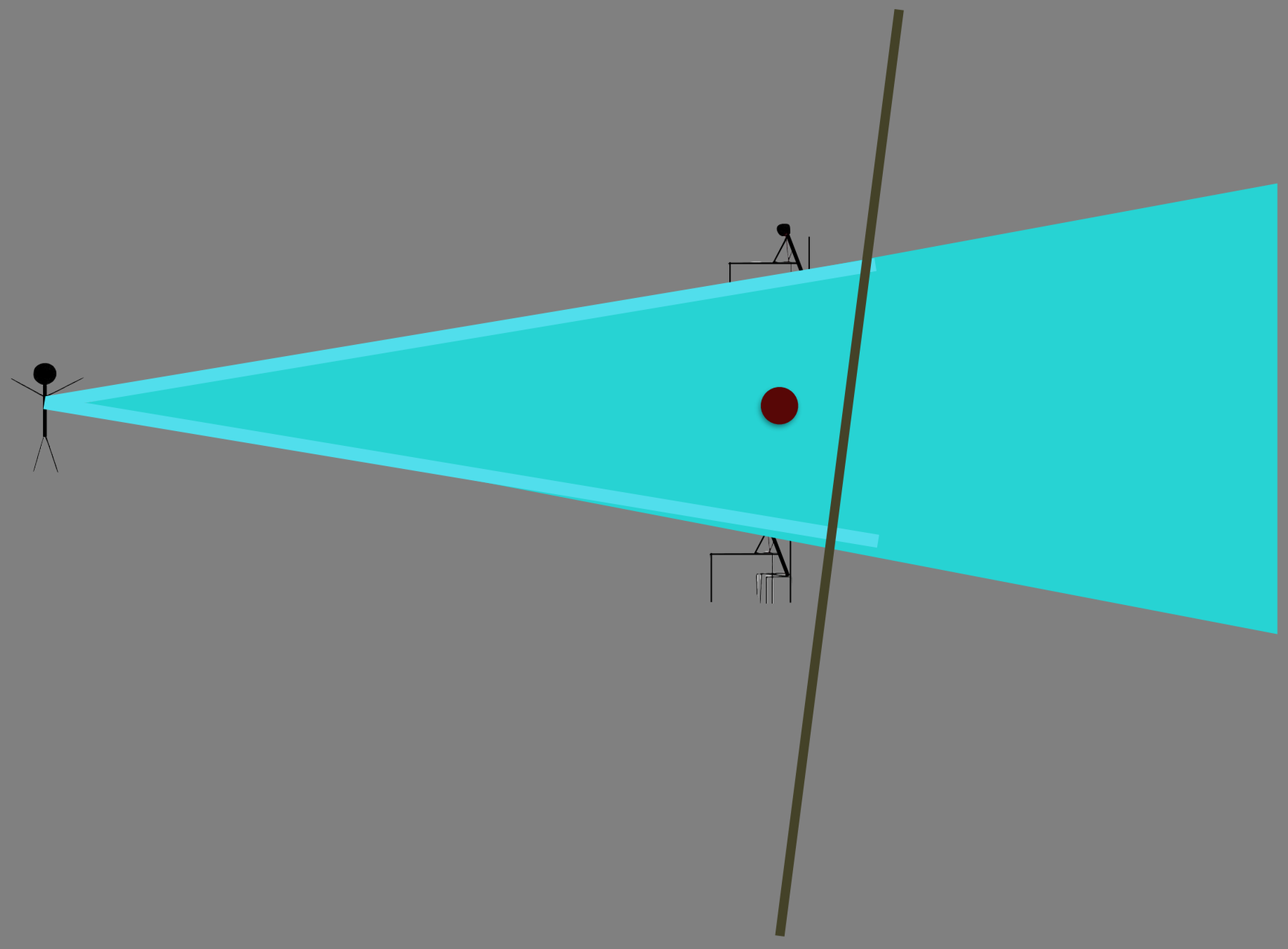
Past

Futuro



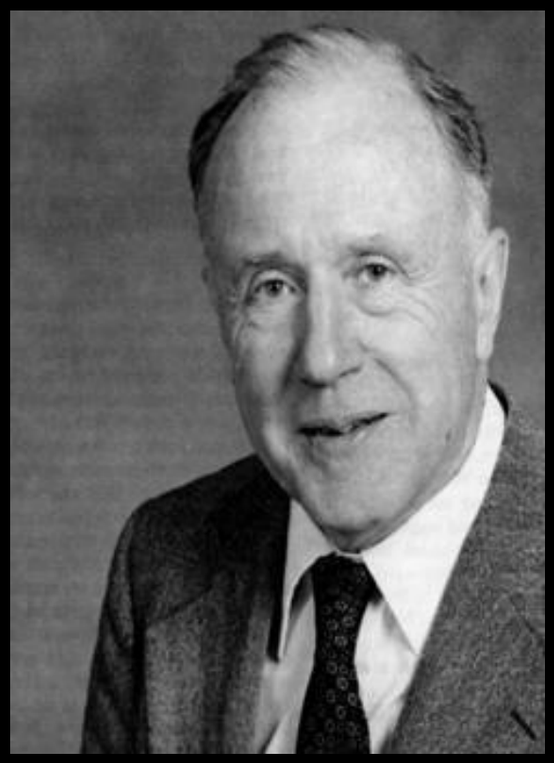
Passato

Futuro

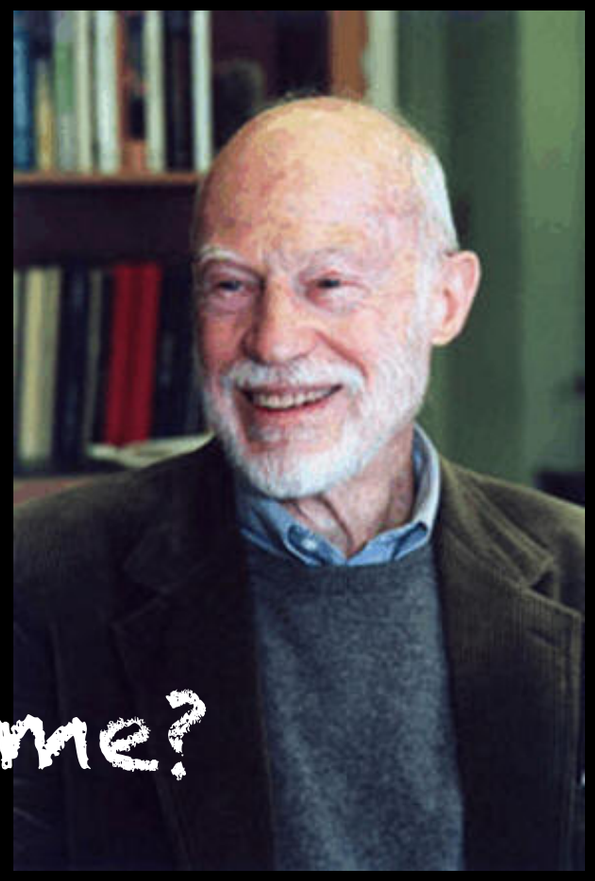


Passato

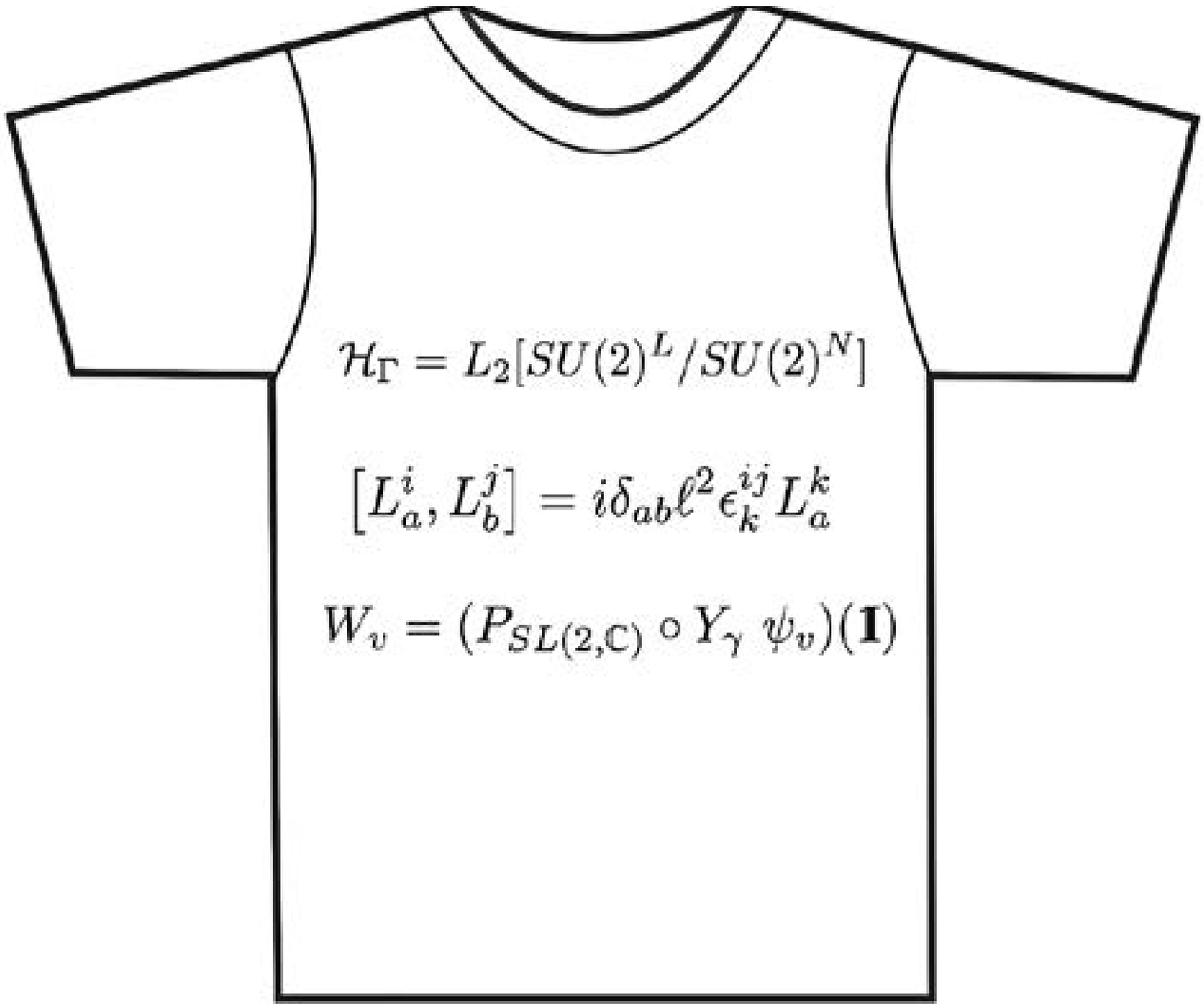
II. The world without time



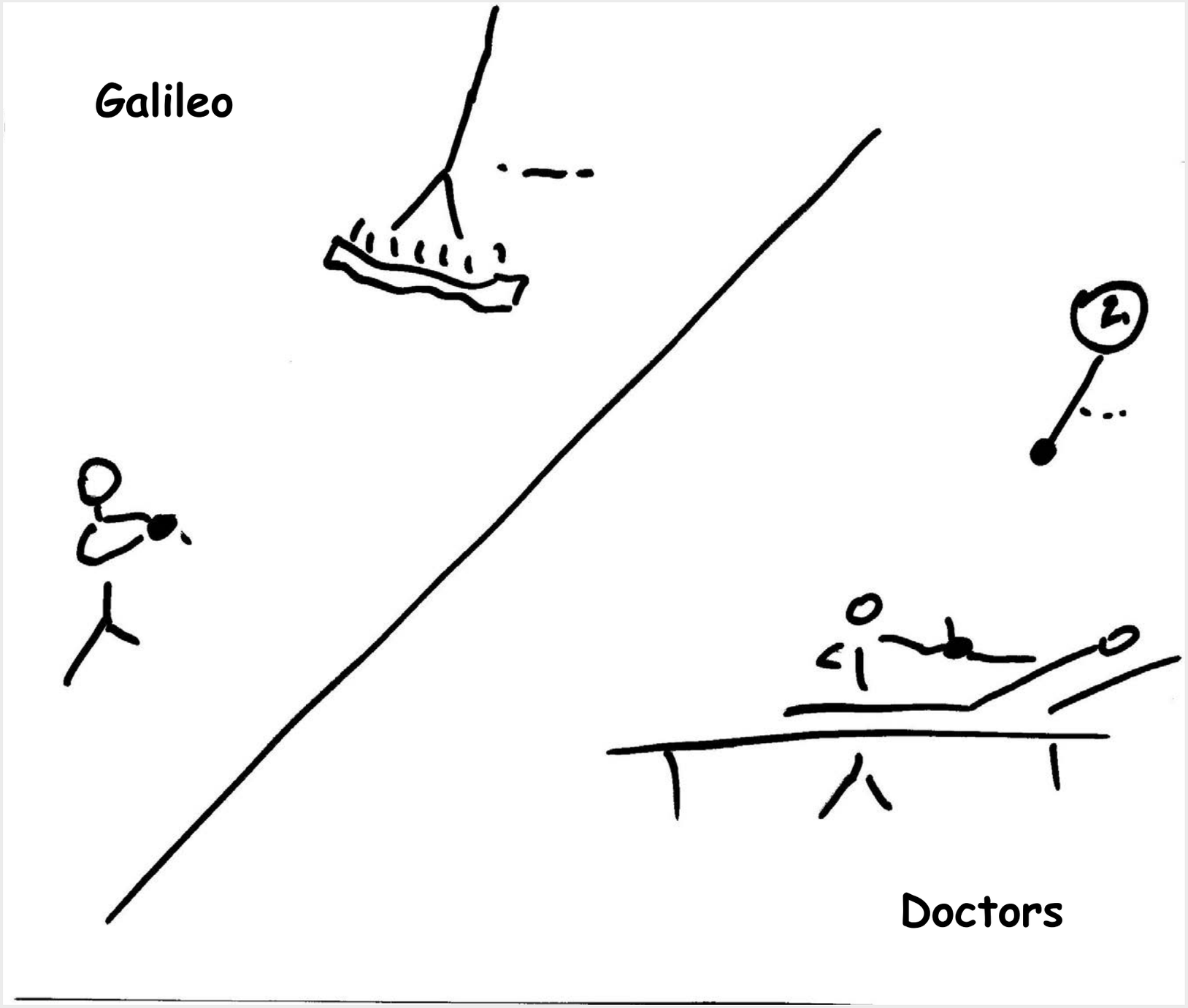
$$G_{abcd}\frac{\delta}{\delta g_{ab}}\frac{\delta}{\delta g_{cd}}\Psi[g] - g\,R[g]\Psi[g] = 0$$



An equation without time?

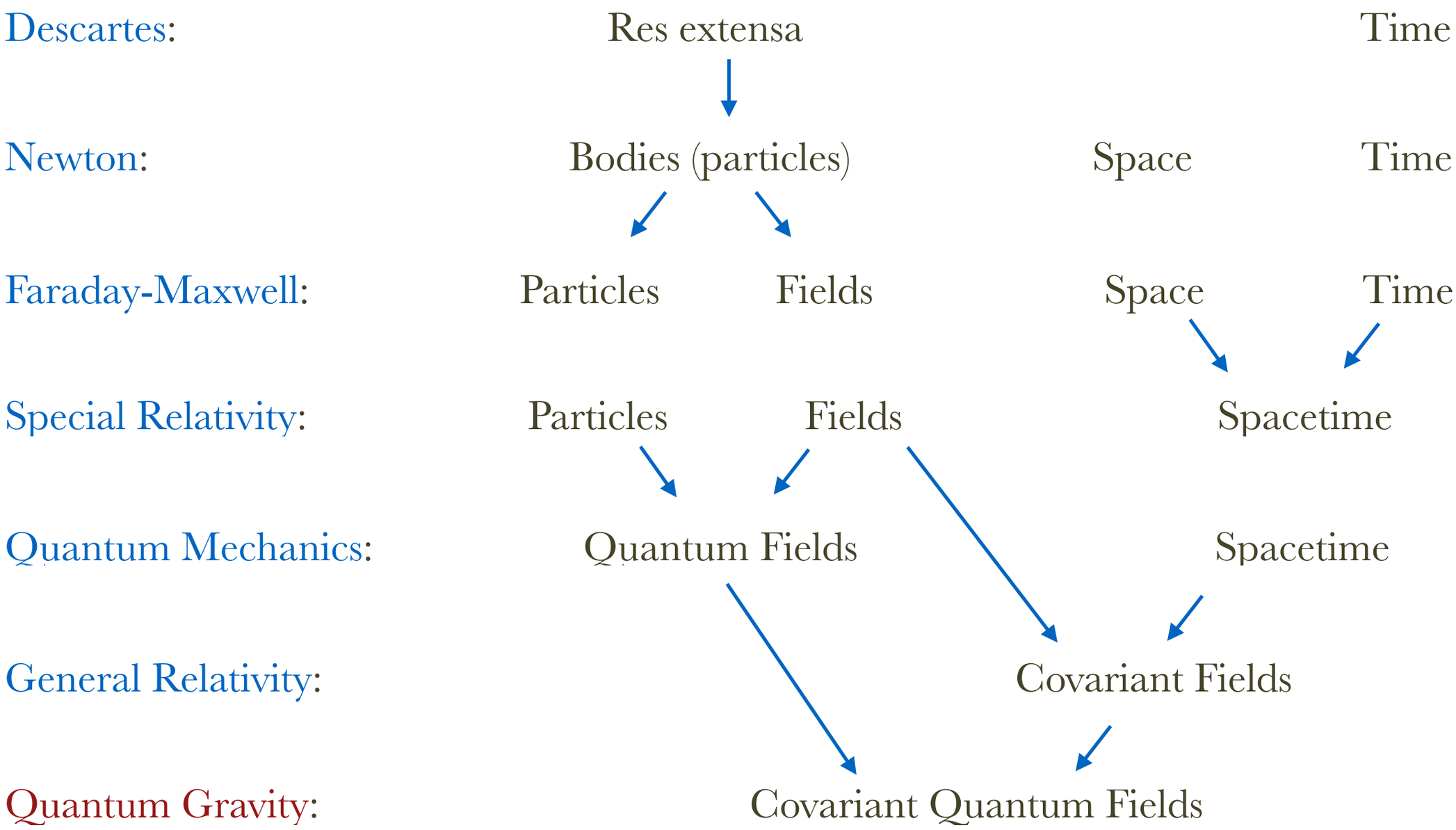


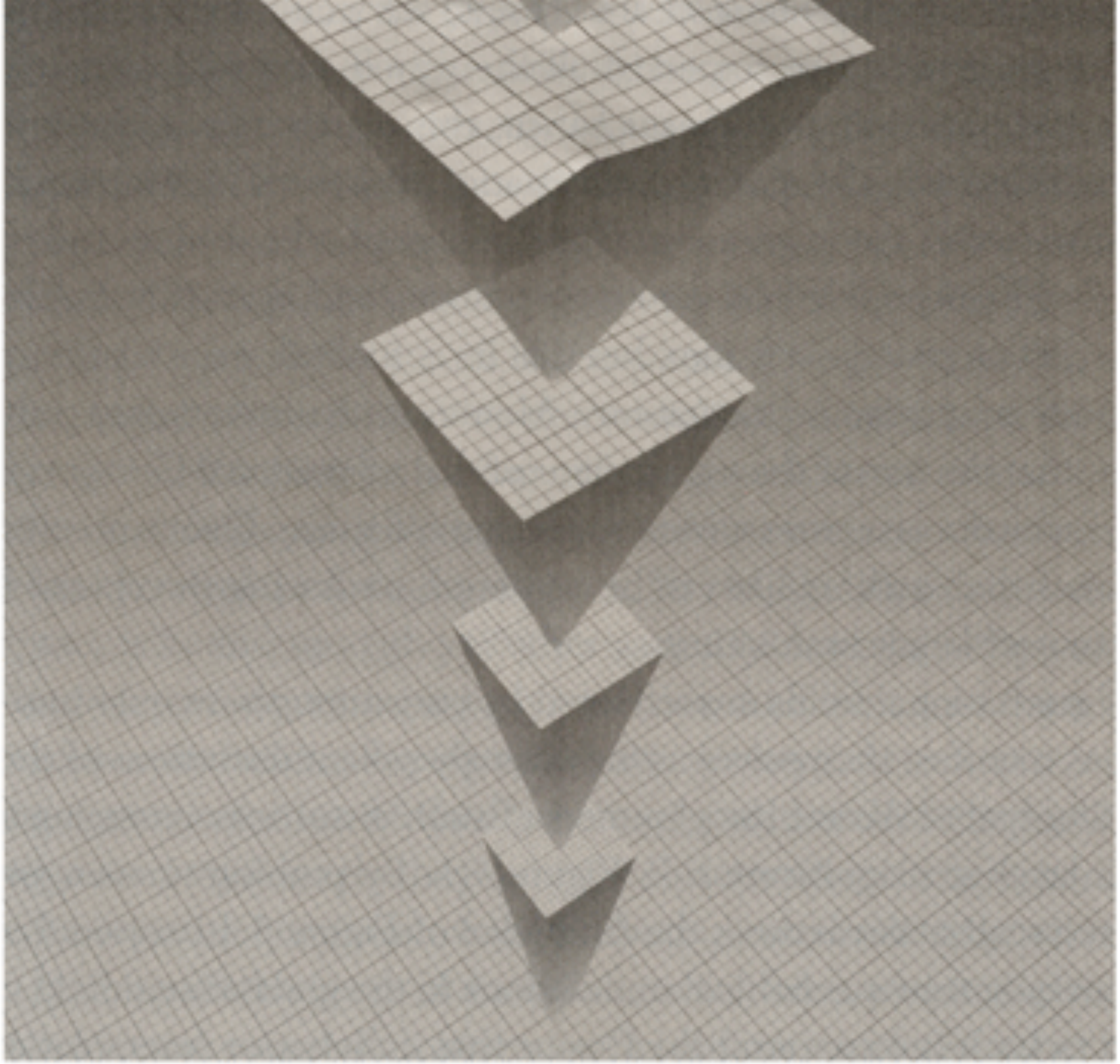
Loop quantum gravity

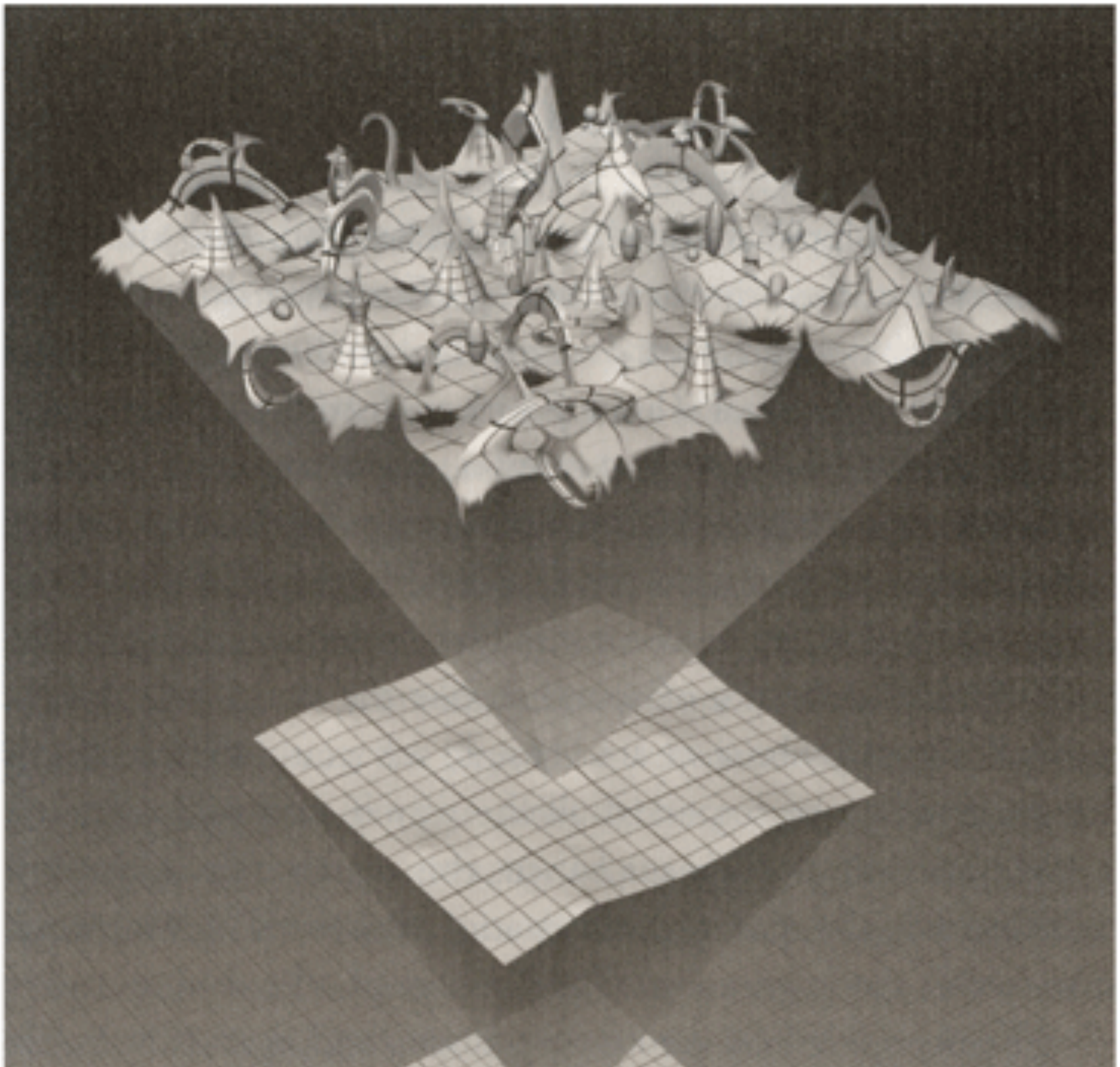

Galileo
Doctors

Things do not change
"in time",
they change one with respect
to the other.

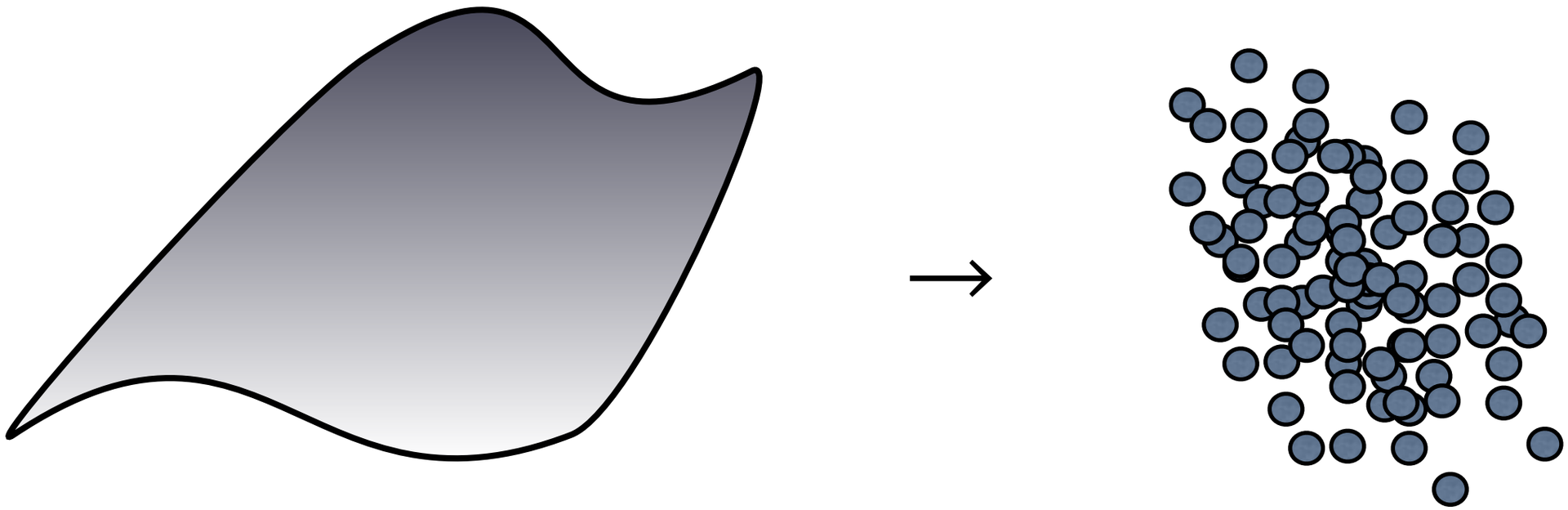
ontology of fundamental physics







Quantum gravity



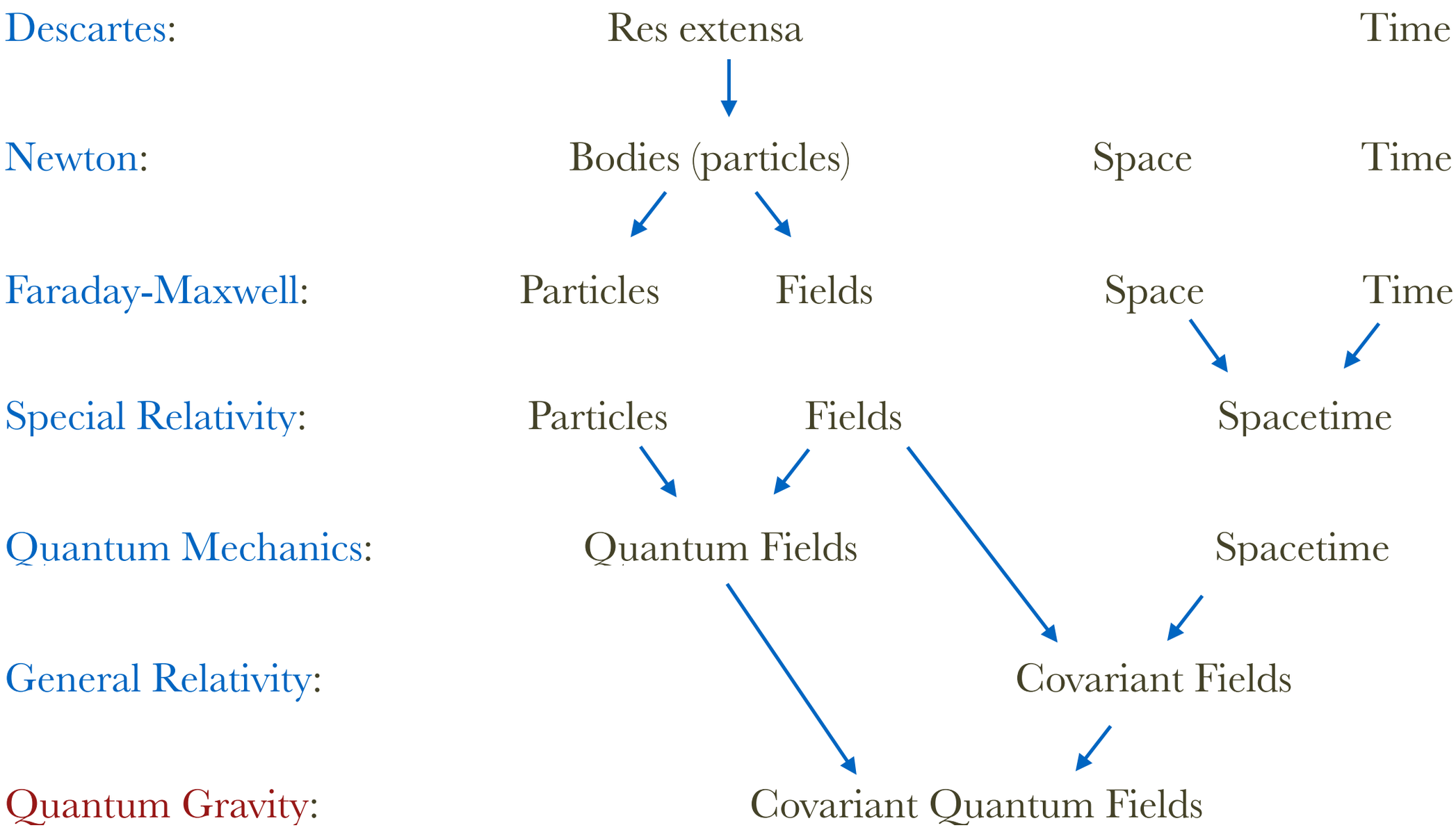
Space time is granular, probabilistic, and relational.


REGULATEUR
Régulateur

How does “time”
come back?

III. Recovering time, layer by layer

ontology of fundamental physics



Time has a direction
only when there is heat

Heat is related to
lack of detailed
knowledge

Time is our
ignorance

The source of the flow of time is probably in our own structure and our own perspective on the world.

“We know the Earth turns,
But we do not pay attention,
the ground on which we walk does not appear to move,
and we live in peace.
So is time, in our life.”

Marcel Proust

Dal tempo degli angeli...

... al tempo dei matematici ...

Time is a stratified notion

- “Flows”
- There are traces of the past, not future
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- Time is unique
- Time is all over the universe
- All evolve “in time”
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- Because of the way our brain is wired
- Only because of thermodynamics
- Only in the context of incomplete information
- Only for small velocities
- Only if we disregard gravity
- Variables evolve with respect to one another
- Yes


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