

• Information Sheet — Theory of Relational Coexistence (TCR)

• What is TCR

- The Theory of Relational Coexistence (TCR) is a scientific proposal that reformulates the foundations of physics.

Instead of starting from spacetime as the primary entity, TCR assumes that reality is built from a network of relations among entities.

These relations form a deeper layer of reality, called R' , from which the observable spacetime (R) arises and evolves.

The world we experience—made of events, distances, times, and measurements—is nothing but the manifestation of these fundamental relations.

In other words: TCR does not see space as the “container” and time as the “flow”; rather, it is the evolving of relations that creates time, and entities moving apart that creates space.

• Key points

• Relational ontology (R'):

- Entities do not exist in isolation, but only insofar as they are connected by relations.
- Each relation has a degree of coexistence, measurable from 0 to 1.
- Space and time emerge when coexistences change and decrease.

• Actualization (Π function):

- Potential entities in R' become real entities in R .
- Each actualized entity (e) maintains a one-to-one link with its corresponding potential entity (e') in R' .

• Relational entropy:

- Defined as the negative of the sum of coexistence differences in R' .
- Explains the arrow of time, cosmic expansion, the breaking of the original symmetry, and quantum decoherence.

• Gravity as an anti-entropic force:

- Seeks to maintain or increase coexistence, opposing dispersion.
- In black holes, it tends to restore perfect coherence (time comes to a halt).

• Wave–particle duality:

- A wave corresponds to highly coexistent entities (unions), a particle to less coexistent entities (separations).
- Quantum duality is reinterpreted as a natural thermodynamic cycle.

- **TCR-Cosmo cosmology:**

- Expansion is not perfectly homogeneous but depends on the degree of coexistence of large clusters and cosmic voids.
- Provides testable predictions via cosmic chronometers and galaxy surveys.

Why it matters

- Proposes a paradigm shift: from spacetime as the foundation to relation as the foundation.
- Provides a unique interpretive bridge between quantum mechanics and general relativity.
- Offers a framework in which many paradoxes and mathematical “infinities” disappear (Big Bang, black-hole singularities, information loss).
- Opens up new experimental tests in cosmology and quantum phenomena.
- Links and contacts.

Link e contatti

- **DOI preprint TCR:** <https://doi.org/10.5281/zenodo.17151668>
- **DOI preprint TCR-Cosmo:** <https://doi.org/10.5281/zenodo.17178037>
- **Author:** Pietro Curatola
- **Contact e-mail:** pietro.curatola@ingpec.eu
- **Website / project page:** <https://tcr-theory.org>