EN_2: Einstein-VED: Determinism, Indeterminacy, and Free Will

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1. Content and Container

1.1 Conceptual Distinction

We distinguish between:

- **Container**: the space-time structure where physical phenomena occur.
- **Content**: the states, processes, and physical relations that exist within said structure.

The container must be defined coherently and independently of the content.

1.2 Space-Time as a 3S + T Container

The container of the universe is defined as a four-dimensional space-time: three spatial (3S) and one temporal (T).

These four dimensions must be **dimensionally compatible** and not ontologically distinct. Their differentiation is not fundamental, but conventional.

1.3 Units and Conversion Constants

The units used to measure dimensions (meters, yards, seconds, etc.) do not define the nature of the dimensions, but only their measurement scale.

Using different units requires conversion constants. The constant c fulfills this role by relating length and time. However, c does not introduce additional physical content; it is merely a conversion factor.

When measuring lengths as the distance traveled by light in one second, we obtain $c = 1$, dimensionally unifying space and time.

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2. Function f: Definition, Causality, and Determination

2.1 Domain of f

Let f be the function that describes the state of a space-time point (x, y, z, t_0):

- f is defined for all $t < t_0$ (past) within the light cone.
- For $t \geq t_0$ (future), f is not yet defined from the perspective of t_0.

2.2 Causal Determination

- The state of f at each point is **completely defined by its causal past**.
- The future **cannot alter** the past.
- Perceived indeterminacy is **epistemic**, derived from internal information limitation.

2.3 Extension of f to All of Space-Time

- f exists for all $t \in T$ as an internal function of the 3S+T block-universe.
- Every present and future instant **exists**.
- Indeterminacy arises only from within time, due to ignorance of the future.

> "God does not play dice, but allows us to use them while we are ignorant of the future relative to our position at $t = t_0$".

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3. Indeterminacy, Free Will, and Determinism

3.1 Compatibility between Determinism and Freedom

- The universe is deterministic: each point in space-time has a state defined by its past.

- From an internal point t_0, the future is unknown and each choice can define the world line.
- The function f defines the past only after events occur.

3.2 Choice and Temporal Dependence

- As long as the choice is not conditioned by the past, you can decide actions (for example: right or left).
- Once the event passes, the dependence of f **cannot be reversed**.

3.3 Freedom protected by ignorance

- You are free because the future is forbidden to you: you cannot know it.
- If you knew the future, you could not change anything.
- Limited access to the future ensures real freedom and eliminates the classical paradox.

> Freedom is a gift of ignorance: while we ignore the future, our choice is truly our own.

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4. Conclusion

- The universe is deterministic and coherent (Einstein was right).
- Perceived indeterminacy is only **epistemic**.
- Human freedom exists thanks to ignorance of the future.
- This framework establishes the conceptual foundation of Einstein-VED and prepares section 3 to address interpretations of quantum mechanics.

End of EN_2