EN_9: Einstein-VED Framework: Determinism, 3S+T Geometry and Rigorous Critique of Quantum Mechanics

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1. Fundamental Postulate: Velocity as Space-Time Dependence

1.1 Rigorous mathematical definition

Velocity defines the functional dependence between space and time:

$$v = \frac{ds}{dt}$$

This relation is fundamental and establishes:

- **For** $v = 0$: Space and time are independent and orthogonal
- **For** $v \neq 0$: Space and time are dependent (non-orthogonal)
- **For** $v = c$: Total dependence ($ds = dt$ in natural units)

1.2 Immediate structural consequence

If space and time are dependent when $v \neq 0$, then:

- Position (space) cannot be an independent variable
- Momentum (linked to time) cannot be independent of position
- **Two independent observables do not exist** in the ontological sense

2. The function $f(t)$: Deterministic reality in 3S+T

2.1 Definition of the universal function

Let $f(t)$ be the function that describes the complete state of the universe at time t.

Properties:

- $f(t)$ is **defined for all** t (external perspective)
- For each t_0 (internal perspective), only $f(t \leq t_0)$ is accessible
- The future ($t > t_0$) is inaccessible from within, **not ontologically undefined**

2.2 Complete determinism

$$f(t) = F(\text{initial conditions}, t)$$

where F is deterministic. There is no fundamental randomness.

3. Axiomatic critique of Heisenberg's uncertainty principle

3.1 The conceptual error

Quantum mechanics (QM) assumes that position (x) and momentum (p) are independent observables.

But if:

$$v = \frac{ds}{dt} \neq 0$$

then space and time are dependent, and therefore x and p are dependent.

3.2 The contradiction

The commutation relation:

$$[\hat{x}, \hat{p}] = i(\frac{h}{2\pi})$$

presupposes an independence that does not exist structurally.

The principle $\Delta x \cdot \Delta p \geq (\frac{h}{2\pi}) / 2$ is therefore:

- **Not a natural law**
- **An epistemic limit** (of knowledge from within)
- **A mathematical artifact** of treating as independent what is dependent

4. 3S+T Geometry: The universal container

4.1 Minkowski metric

$$ds^2 = -dt^2 + dx^2 + dy^2 + dz^2$$

With $c = 1$ (natural units), space and time are dimensionally compatible.

4.2 Lorentz transformations

$$dx' = \gamma(dx - vdt)$$

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where $v = ds / dt$ measures the space-time dependence.

4.3 Emergence of space

Space arises from the quadratic difference of relative times:

$$ds^2 = (dt^2 - dt'^2) = (dt^2 - dt'^2)(dt^2 + dt'^2)$$

5. Freedom and determinism: Resolution of the dilemma

5.1 Logical compatibility

- **Ontological level**: $f(t)$ is deterministic (Einstein was right)
- **Epistemic level**: Ignorance of the future from t_0 (real freedom)

- **No contradiction**: Freedom is internal experience within a deterministic framework

5.2 Why there is freedom

"If you knew your future, you could change nothing about it. Free will exists because the future does not influence the past, but the past does condition the future."

From each t_0 :

- You do not know $f(t > t_0)$
- Your decisions define $f(t > t_0)$
- Once defined, it becomes part of the past irreversibly

6. What quantum mechanics really is

6.1 Correct status

QM is a **formalism to quantify ignorance**:

- ψ describes **our knowledge**, not reality
- $|\psi|^2$ quantifies **our uncertainty**
- "Collapse" is **update of knowledge**, not physical change

6.2 What QM is not

- **Not an ontological theory** (it does not describe ultimate reality)
- **Not complete** (it only describes the internal perspective)
- **Not fundamental** (it is based on false premises about space-time independence)

7. Consequences for physical research

7.1 Einstein-VED Program

1. **Find** $f(t)$: Fundamental deterministic theory
2. **Show emergence**: How QM arises as an internal description of $f(t)$
3. **Respect** $v = ds / dt$: Never treat space and time as independent

7.2 Abandon dogmas

- QM as the "final word" in physics
- The interpretation of ψ as reality
- The renunciation of determinism

8. Conclusion: Vindication of Einstein

Einstein was right about:

1. **"God does not play dice"**: $f(t)$ is deterministic
2. **"QM is incomplete"**: It only describes the internal perspective
3. **"Independent reality exists"**: $f(t)$ exists even if we do not measure it

The Einstein-VED framework provides:

- Mathematical basis for his intuition
- Rigorous critique of QM's assumptions
- Clear path toward deterministic physics

Reference

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