

$E=mc^2 = E=m$: The Constants Illusion Exposed

Why Einstein's c-constant conceals the fundamental error

From Dynamic Ratios to the Constants Illusion

Johann Pascher

Department of Communications Engineering,
Higher Technical Federal Institute (HTL), Leonding, Austria
johann.pascher@gmail.com

November 28, 2025

Abstract

This work reveals the central point of Einstein's relativity theory: $E=mc^2$ is mathematically identical to $E=m$. The only difference lies in Einstein's treatment of c as a "constant" instead of a dynamic ratio. By fixing $c = 299,792,458 \text{ m/s}$, the natural time-mass duality $T \cdot m = 1$ is artificially "frozen," leading to apparent complexity. The T0 theory shows: c is not a fundamental law of nature, but only a ratio that must be variable if time is variable. Einstein's error was not $E=mc^2$ itself, but the constant-setting of c .

Contents

1	The Central Thesis: $E=mc^2 = E=m$	2
1.1	The Mathematical Identity	2
1.2	What is c really?	2
2	Einstein's Fundamental Error: The Constant-Setting	2
2.1	The Act of Constant-Setting	2
2.2	The Problem of Time Variability	2
2.3	The T0 Resolution	3
3	The Constants Illusion: How it Works	3
3.1	The Mechanism of the Illusion	3
3.2	What Really Happens (T0 View)	3
4	c as Ratio vs. c as Constant	3
4.1	c as Natural Ratio (T0)	3
4.2	c as Artificial Constant (Einstein)	4
5	The Time Dilation Paradox	4

5.1	Einstein's Contradiction Exposed	4
5.2	Einstein's Hidden Solution	4
5.3	T0's Natural Solution	4
6	The Mathematical Demonstration	5
6.1	From $E=mc^2$ to $E=m$	5
6.2	The Reverse Direction: From $E=m$ to $E=mc^2$	5
7	The Arbitrariness of Constant Choice: c or Time?	5
7.1	Einstein's Arbitrary Decision	5
7.2	Option 1: Einstein's c-constant	5
7.3	Option 2: Time-constant (Einstein could have chosen)	6
7.4	Mathematical Equivalence of Both Options	6
7.5	Why Einstein Chose Option 1	6
7.6	T0's Overcoming of Both Options	6
7.7	Liberation from Constant Constraint	7
8	The Reference Point Revolution: Earth → Sun → Nature	7
8.1	The Reference Point Analogy: Geocentric → Heliocentric → T0	7
8.2	Why We Need Reference Points	8
8.3	The Right vs. Wrong Reference Point	8
9	When Something Becomes "Constant"	9
9.1	The Fundamental Reference Point Problem	9
9.2	The Natural Stage: Everything is Relative	9
9.3	The Moment of Reference Point Setting	9
9.4	The Reference Point Problematic	9
9.5	T0's Reference Point-Free Physics	10
9.6	Example: The Meter Definition	10
9.7	The Circular Error: Humans Define Their Own "Constants"	10
9.8	T0's Resolution of the Reference Point Illusion	11
10	Why c-Constancy is Not Provable	11
10.1	The Fundamental Measurement Problem	11
10.2	The Gauge Definition Problem	11
10.3	The Systematic Compensation Problem	11
10.4	The Burden of Proof Problem	12
10.5	T0 Prediction for Precise Measurements	12
11	Ontological Consideration: Calculations as Constructs	12
11.1	The Fundamental Epistemological Limit	12
11.2	Einstein's Construct vs. T0's Construct	12
11.3	The Ontological Relativity	13
11.4	Why T0 is Still "Better"	13
11.5	The Epistemological Humility	13
11.6	The Pragmatic Consequence	14
11.7	The Ontological Humility	14
12	The Practical Consequences	14

12.1 Why $E=mc^2$ "Works"	14
12.2 When $E=mc^2$ Fails	14
12.3 T0's Universal Validity	15
13 The Correction of Physics History	15
13.1 Einstein's True Achievement	15
13.2 The Historical Irony	15
14 The T0 Perspective: c as Living Ratio	15
14.1 c as Expression of Time-Mass Duality	15
14.2 The Dynamic Speed of Light	15
15 Experimental Tests of c-Variability	16
15.1 Proposed Experiments	16
15.2 Expected Results	16
16 Conclusions	16
16.1 The Central Recognition	16
16.2 Physics After the Constants Illusion	16
16.3 Einstein's Corrected Legacy	17

1 The Central Thesis: $E=mc^2 = E=m$

The Fundamental Recognition

$E=mc^2$ and $E=m$ are mathematically identical!

The only difference: Einstein treats c as a "constant," although c is a dynamic ratio.

Einstein's error: $c = 299,792,458 \text{ m/s} = \text{constant}$

T0 truth: $c = L/T = \text{variable ratio}$

1.1 The Mathematical Identity

In natural units:

$$E = mc^2 = m \times c^2 = m \times 1^2 = m \quad (1)$$

This is not an approximation - this is exactly the same equation!

1.2 What is c really?

$$c = \frac{\text{Length}}{\text{Time}} = \frac{L}{T} \quad (2)$$

c is a ratio, not a natural constant!

2 Einstein's Fundamental Error: The Constant-Setting

2.1 The Act of Constant-Setting

Einstein set: $c = 299,792,458 \text{ m/s} = \text{constant}$

What does this mean?

$$c = \frac{L}{T} = \text{constant} \Rightarrow \frac{L}{T} = \text{fixed} \quad (3)$$

Implication: If L and T can vary, their ratio must remain constant.

2.2 The Problem of Time Variability

Einstein recognized himself: Time dilates!

$$t' = \gamma t \quad (\text{time is variable}) \quad (4)$$

But simultaneously he claimed:

$$c = \frac{L}{T} = \text{constant} \quad (5)$$

This is a logical contradiction!

2.3 The T0 Resolution

T0 insight: $T(x, t) \cdot m = 1$

This means:

- Time $T(x, t)$ **must** be variable (coupled to mass)
- Therefore $c = L/T$ **cannot** be constant
- c is a **dynamic ratio**, not a constant

3 The Constants Illusion: How it Works

3.1 The Mechanism of the Illusion

Step 1: Einstein sets $c = \text{constant}$

$$c = 299,792,458 \text{ m/s} = \text{fixed} \quad (6)$$

Step 2: Time becomes "frozen" by this

$$T = \frac{L}{c} = \frac{L}{\text{constant}} = \text{apparently determined} \quad (7)$$

Step 3: Time dilation becomes "mysterious effect"

$$t' = \gamma t \quad (\text{why?} \rightarrow \text{complicated relativity theory}) \quad (8)$$

3.2 What Really Happens (T0 View)

Reality: Time is naturally variable through $T(x, t) \cdot m = 1$

Einstein's constant-setting "freezes" this natural variability artificially

Result: One needs complicated theory to repair the "frozen" dynamics

4 c as Ratio vs. c as Constant

4.1 c as Natural Ratio (T0)

$$c(x, t) = \frac{L(x, t)}{T(x, t)} \quad (9)$$

Properties:

- c varies with location and time
- c follows the time-mass duality
- No artificial constants
- Natural simplicity: $E = m$

4.2 c as Artificial Constant (Einstein)

$$c = 299,792,458 \text{ m/s} = \text{constant everywhere} \quad (10)$$

Problems:

- Contradiction to time dilation
- Artificial "freezing" of time dynamics
- Complicated repair mathematics needed
- Inflated formula: $E = mc^2$

5 The Time Dilation Paradox

5.1 Einstein's Contradiction Exposed

Einstein claims simultaneously:

$$c = \text{constant} \quad (11)$$

$$t' = \gamma t \quad (\text{time varies}) \quad (12)$$

But:

$$c = \frac{L}{T} \quad \text{and} \quad T \text{ varies} \quad \Rightarrow \quad c \text{ cannot be constant!} \quad (13)$$

5.2 Einstein's Hidden Solution

Einstein "solves" the contradiction through:

- Complicated Lorentz transformations
- Mathematical formalisms
- Space-time constructions
- **But the logical contradiction remains!**

5.3 T0's Natural Solution

No contradiction in T0:

$$T(x, t) \cdot m = 1 \quad \Rightarrow \quad \text{time is naturally variable} \quad (14)$$

$$c = \frac{L}{T} \quad \Rightarrow \quad c \text{ is naturally variable} \quad (15)$$

No constant-setting → No contradictions → No complicated repair mathematics

6 The Mathematical Demonstration

6.1 From $E=mc^2$ to $E=m$

Starting equation: $E = mc^2$

c in natural units: $c = 1$

Substitution:

$$E = mc^2 = m \times 1^2 = m \quad (16)$$

Result: $E = m$

6.2 The Reverse Direction: From $E=m$ to $E=mc^2$

Starting equation: $E = m$

Artificial constant introduction: $c = 299,792,458 \text{ m/s}$

Inflating the equation:

$$E = m = m \times 1 = m \times \frac{c^2}{c^2} = m \times c^2 \times \frac{1}{c^2} \quad (17)$$

If one defines c^2 as "conversion factor":

$$E = mc^2 \quad (18)$$

This shows: $E = mc^2$ is only $E = m$ with artificial inflation factor c^2 !

7 The Arbitrariness of Constant Choice: c or Time?

7.1 Einstein's Arbitrary Decision

The Fundamental Choice Option

One can choose what should be "constant"!

Option 1 (Einstein's choice): $c = \text{constant} \rightarrow \text{time becomes variable}$

Option 2 (alternative): $\text{time} = \text{constant} \rightarrow c \text{ becomes variable}$

Both describe the same physics!

7.2 Option 1: Einstein's c-constant

Einstein chose:

$$c = 299,792,458 \text{ m/s} = \text{constant (defined)} \quad (19)$$

$$t' = \gamma t \quad (\text{time becomes automatically variable}) \quad (20)$$

Language convention:

- "Speed of light is universally constant"
- "Time dilates in strong gravitational fields"
- "Clocks run slower at high velocities"

7.3 Option 2: Time-constant (Einstein could have chosen)

Alternative choice:

$$t = \text{constant (defined)} \quad (21)$$

$$c(x, t) = \frac{L(x, t)}{t} = \text{variable} \quad (22)$$

Alternative language convention:

- "Time flows equally everywhere"
- "Speed of light varies with location"
- "Light becomes slower in strong gravitational fields"

7.4 Mathematical Equivalence of Both Options

Both descriptions are mathematically identical:

Phenomenon	Einstein view	Time-constant view
Gravitation	Time slows down	Light slows down
Velocity	Time dilation	c-variation
GPS correction	"Clocks run differently"	"c is different"
Measurements	Same numbers	Same numbers

Table 1: Two views, identical physics

7.5 Why Einstein Chose Option 1

Historical reasons for Einstein's decision:

- **Michelson-Morley:** c seemed locally constant
- **Aesthetics:** "Universal constant" sounded elegant
- **Tradition:** Newtonian constant physics
- **Conceivability:** c-constancy easier to imagine than time constancy
- **Authority effect:** Einstein's prestige fixed this choice

But it was only a convention, not a natural law!

7.6 T0's Overcoming of Both Options

T0 shows: Both choices are arbitrary!

$$T(x, t) \cdot m = 1 \quad (\text{natural duality without constant constraint}) \quad (23)$$

T0 insight:

- **Neither** c nor time are "really" constant

- **Both** are aspects of the same $T \cdot m$ dynamics
- **Constancy** is only definition convention
- **$E = m$** is the constant-free truth

7.7 Liberation from Constant Constraint

Instead of choosing between:

- c constant, time variable (Einstein)
- Time constant, c variable (alternative)

T0 chooses:

- **Both dynamically coupled** via $T \cdot m = 1$
- **No arbitrary fixations**
- **Natural ratios** instead of artificial constants

8 The Reference Point Revolution: Earth → Sun → Nature

8.1 The Reference Point Analogy: Geocentric → Heliocentric → T0

The Reference Point Revolution: From Earth → Sun → Nature

Geocentric (Ptolemy): Earth at center

- Complicated epicycles needed
- Works, but artificially complicated

Heliocentric (Copernicus): Sun at center

- Simple ellipses
- Much more elegant and simple

T0-centric: Natural ratios at center

- $T(x, t) \cdot m = 1$ (natural reference point)
- Even more elegant: $E = m$

Einstein's c -constant corresponds to the geocentric system:

- **Human** reference point at center (like Earth at center)
- **Complicated** mathematics needed (like epicycles)
- **Works** locally, but artificially inflated

T0's natural ratios correspond to the heliocentric system:

- **Natural** reference point at center (like Sun at center)
- **Simple** mathematics (like ellipses)
- **Universally valid and elegant**

8.2 Why We Need Reference Points

Reference points are necessary and natural:

- **For measurements:** We need standards for comparison
- **For communication:** Common basis for exchange
- **For technology:** Practical applications require units
- **For science:** Reproducible experiments need standards

The question is not WHETHER, but WHICH reference point:

System	Reference Point	Complexity	Elegance
Geocentric	Earth	Epicycles	Low
Heliocentric	Sun	Ellipses	High
Einstein	c-constant	Relativity theory	Medium
T0	$T(x, t) \cdot m = 1$	$E = m$	Maximum

Table 2: Reference point systems comparison

8.3 The Right vs. Wrong Reference Point

Einstein's error was not to choose a reference point:

- But to choose the wrong reference point!

Wrong reference point (Einstein): $c = 299,792,458 \text{ m/s} = \text{constant}$

- Based on human definition
- Leads to complicated mathematics
- Creates logical contradictions

Right reference point (T0): $T(x, t) \cdot m = 1$

- Based on natural ratio
- Leads to simple mathematics: $E = m$
- No contradictions, pure elegance

9 When Something Becomes "Constant"

9.1 The Fundamental Reference Point Problem

The Reference Point Illusion

Something only becomes "constant" when we define a reference point!

Without reference point: All ratios are relative and dynamic

With reference point: One ratio becomes artificially "fixed"

Einstein's error: He defined an absolute reference point for c

9.2 The Natural Stage: Everything is Relative

Before any reference point definition:

$$c_1 = \frac{L_1}{T_1} \quad (24)$$

$$c_2 = \frac{L_2}{T_2} \quad (25)$$

$$c_3 = \frac{L_3}{T_3} \quad (26)$$

$$\vdots \quad (27)$$

All c-values are relative to each other. None is "constant".

9.3 The Moment of Reference Point Setting

Einstein's fatal step:

"I define: $c = 299,792,458 \text{ m/s}$ = reference point" (28)

What happens at this moment:

- An **arbitrary reference point** is set
- All other c-values are measured relative to this
- The **dynamic ratio** becomes a "constant"
- The **natural relativity** is artificially "frozen"

9.4 The Reference Point Problematic

Every reference point is arbitrary:

- Why $299,792,458 \text{ m/s}$ and not $300,000,000 \text{ m/s}$?
- Why in m/s and not in other units?
- Why measured on Earth and not in space?
- Why at this time and not at another?

9.5 T0's Reference Point-Free Physics

T0 eliminates all reference points:

$$T(x, t) \cdot m = 1 \quad (\text{universal relation without reference point}) \quad (29)$$

- No arbitrary fixations
- All ratios remain dynamic
- Natural relativity is preserved
- Fundamental simplicity: $E = m$

9.6 Example: The Meter Definition

Historical development of meter definition:

1. **1793:** 1 meter = 1/10,000,000 of Earth meridian (Earth reference point)
2. **1889:** 1 meter = prototype meter in Paris (object reference point)
3. **1960:** 1 meter = 1,650,763.73 wavelengths of krypton-86 (atom reference point)
4. **1983:** 1 meter = distance light travels in 1/299,792,458 s (c reference point)

What does this show?

- Each definition is **human arbitrariness**
- The **reference point** changes with human technology
- There is **no "natural" length unit** - only human agreements
- Humans make c "constant" by definition - not nature!

9.7 The Circular Error: Humans Define Their Own "Constants"

In 1983 humans defined:

$$1 \text{ meter} = \frac{1}{299,792,458} \times c \times 1 \text{ second} \quad (30)$$

This makes c automatically "constant" - through human definition, not through natural law:

$$c = \frac{299,792,458 \text{ meters}}{1 \text{ second}} = 299,792,458 \text{ m/s} \quad (31)$$

Circular reasoning: Humans define c as constant and then "measure" a constant!
Nature is not asked in this process!

9.8 T0's Resolution of the Reference Point Illusion

T0 recognizes:

- Definition \neq natural law
- Measurement reference point \neq physical constant
- Practical agreement \neq fundamental truth

T0 solution:

For measurements: Use practical reference points (32)

For natural laws: Use reference point-free relations (33)

10 Why c-Constancy is Not Provable

10.1 The Fundamental Measurement Problem

To measure c , we need:

$$c = \frac{L}{T} \quad (34)$$

But: We measure L and T with **the same physical processes** that depend on c !

Circular problem:

- Light measures distances $\rightarrow c$ determines L
- Atomic clocks use EM transitions $\rightarrow c$ influences T
- Then we measure $c = L/T \rightarrow$ We measure c with c !

10.2 The Gauge Definition Problem

Since 1983: 1 meter = distance light travels in 1/299,792,458 s

$$c = 299,792,458 \text{ m/s} \quad (\text{not measured, but defined!}) \quad (35)$$

One cannot "prove" what one has defined!

10.3 The Systematic Compensation Problem

If c varies, ALL measuring devices vary equally:

- **Laser interferometers:** use light (c -dependent)
- **Atomic clocks:** use EM transitions (c -dependent)
- **Electronics:** uses EM signals (c -dependent)

Result: All devices automatically compensate the c -variation!

10.4 The Burden of Proof Problem

Scientifically correct:

- One **cannot prove** that something is constant
 - One can only show that it **appears constant within measurement precision**
 - **Each new precision level** could show variation
- Einstein's "c-constancy" was belief, not proof!

10.5 T0 Prediction for Precise Measurements

T0 predicts: At highest precision one will find:

$$c(x, t) = c_0 \left(1 + \xi \times \frac{T(x, t)(x, t) - T(x, t)_0}{T(x, t)_0} \right) \quad (36)$$

with $\xi = 1.33 \times 10^{-4}$ (T0 parameter)

c varies tiny ($\sim 10^{-15}$), but measurable in principle!

11 Ontological Consideration: Calculations as Constructs

11.1 The Fundamental Epistemological Limit

Ontological Truth

All calculations are human constructs!

They can at best give a certain idea of reality.

That calculations are internally consistent proves little about actual reality.

Mathematical consistency \neq ontological truth

11.2 Einstein's Construct vs. T0's Construct

Both are human thought structures:

Einstein's construct:

- $E = mc^2$ (mathematically consistent)
- Relativity theory (internally coherent)
- 10 field equations (work computationally)
- **But:** Based on arbitrary c-constant setting

T0's construct:

- $E = m$ (mathematically simpler)
- $T \cdot m = 1$ (internally coherent)
- $\partial^2 E = 0$ (works computationally)
- **But:** Also only a human thought model

11.3 The Ontological Relativity

What is "really" real?

- Einstein's space-time? (construct)
- T0's energy field? (construct)
- Newton's absolute time? (construct)
- Quantum mechanics' probabilities? (construct)

All are human interpretive frameworks of the inaccessible reality!

11.4 Why T0 is Still "Better"

Not because of "absolute truth," but because of:

1. Simplicity (Occam's Razor):

- $E = m$ is simpler than $E = mc^2$
- One equation is simpler than 10 equations
- Fewer arbitrary assumptions

2. Consistency:

- No logical contradictions (like Einstein's)
- No constant arbitrariness
- Unified thought structure

3. Predictive power:

- Testable predictions
- Fewer free parameters
- Clearer experimental distinction

4. Aesthetics:

- Mathematical elegance
- Conceptual clarity
- Unity

11.5 The Epistemological Humility

T0 does NOT claim to be "absolute truth."

T0 only says:

- "Here is a **simpler** construct"
- "With **fewer** arbitrary assumptions"
- "That is **more consistent** than Einstein's construct"
- "And makes **more testable** predictions"

But ultimately T0 also remains a human thought structure!

11.6 The Pragmatic Consequence

Since all theories are constructs:

Evaluation criteria are:

1. **Simplicity** (fewer assumptions)
2. **Consistency** (no contradictions)
3. **Predictive power** (testable consequences)
4. **Elegance** (aesthetic criteria)
5. **Unity** (fewer separate domains)

By all these criteria T0 is "better" than Einstein - but not "absolutely true".

11.7 The Ontological Humility

The deepest insight:

- Reality itself is inaccessible
- All theories are human constructs
- Mathematical consistency proves no ontological truth
- The best we have: Simpler, more consistent constructs

Einstein's error was not only the c-constant setting, but also the claim to absolute truth of his mathematical constructs.

T0's advantage is not absolute truth, but relative superiority as a thought model.

12 The Practical Consequences

12.1 Why $E=mc^2$ "Works"

$E=mc^2$ works because:

- It is mathematically identical to $E = m$
- c^2 compensates the "frozen" time dynamics
- The T0 truth is unconsciously contained
- Local approximations usually suffice

12.2 When $E=mc^2$ Fails

The constants illusion breaks down at:

- Very precise measurements
- Extreme conditions (high energies/masses)
- Cosmological scales
- Quantum gravity

12.3 T0's Universal Validity

$E = m$ is valid everywhere and always:

- No approximations needed
- No constant assumptions
- Universal applicability
- Fundamental simplicity

13 The Correction of Physics History

13.1 Einstein's True Achievement

Einstein's actual discovery was:

$$E = m \quad (\text{in natural form}) \quad (37)$$

His error was:

$$E = mc^2 \quad (\text{with artificial constant inflation}) \quad (38)$$

13.2 The Historical Irony

The Great Irony

Einstein discovered the fundamental simplicity $E = m$,
but **hid it behind the constants illusion $E = mc^2$!**

The physics world celebrated the complicated form and overlooked the simple truth.

14 The T0 Perspective: c as Living Ratio

14.1 c as Expression of Time-Mass Duality

In T0 theory:

$$c(x, t) = f \left(\frac{L(x, t)}{T(x, t)(x, t)} \right) = f \left(\frac{L(x, t) \cdot m(x, t)}{1} \right) \quad (39)$$

since $T(x, t) \cdot m = 1$.

c becomes an expression of the fundamental time-mass duality!

14.2 The Dynamic Speed of Light

T0 prediction:

$$c(x, t) = c_0 \sqrt{1 + \xi \frac{m(x, t) - m_0}{m_0}} \quad (40)$$

Light moves faster in more massive regions!

(Tiny effect, but measurable in principle)

15 Experimental Tests of c-Variability

15.1 Proposed Experiments

Test 1 - Gravitational dependence:

- Measure c in different gravitational fields
- T0 prediction: c varies with $\sim \xi \times \Delta\Phi_{\text{grav}}$

Test 2 - Cosmological variation:

- Measure c over cosmological time periods
- T0 prediction: c changes with universe expansion

Test 3 - High-energy physics:

- Measure c in particle accelerators at highest energies
- T0 prediction: Tiny deviations at $E \sim \text{TeV}$

15.2 Expected Results

Experiment	Einstein (c constant)	T0 (c variable)
Gravitational field	$c = 299792458 \text{ m/s}$	$c(1 \pm 10^{-15})$
Cosmological time	$c = \text{constant}$	$c(1 + 10^{-12} \times t)$
High energy	$c = \text{constant}$	$c(1 + 10^{-16})$

Table 3: Predicted c -variations

16 Conclusions

16.1 The Central Recognition

The Fundamental Truth

$$E=mc^2 = E=m$$

Einstein's "constant" c is in truth a variable ratio.

The constant-setting was Einstein's fundamental error.

T0 corrects this error by returning to natural variability.

16.2 Physics After the Constants Illusion

The future of physics:

- No artificial constants
- Dynamic ratios everywhere
- Living, variable natural laws
- Fundamental simplicity: $E = m$

16.3 Einstein's Corrected Legacy

Einstein's true discovery: $E = m$ (energy-mass identity)

Einstein's error: Constant-setting of c

T0's correction: Return to natural form $E = m$

Einstein was brilliant - he just stopped one step too early!

References

- [1] Einstein, A. (1905). *Does the inertia of a body depend upon its energy content?* Annalen der Physik, 18, 639–641.
- [2] Michelson, A. A. and Morley, E. W. (1887). *On the relative motion of the Earth and the luminiferous ether.* American Journal of Science, 34, 333–345.
- [3] Pascher, J. (2025). *Field-Theoretic Derivation of the β_T Parameter in Natural Units.* T0 Model Documentation.
- [4] Pascher, J. (2025). *Simplified Dirac Equation in T0 Theory.* T0 Model Documentation.
- [5] Pascher, J. (2025). *Pure Energy T0 Theory: The Ratio-Based Revolution.* T0 Model Documentation.
- [6] Planck, M. (1900). *On the theory of the energy distribution law of the normal spectrum.* Verhandlungen der Deutschen Physikalischen Gesellschaft, 2, 237–245.
- [7] Lorentz, H. A. (1904). *Electromagnetic phenomena in a system moving with any velocity smaller than that of light.* Proceedings of the Royal Netherlands Academy of Arts and Sciences, 6, 809–831.
- [8] Weinberg, S. (1972). *Gravitation and Cosmology.* John Wiley & Sons.