

# Summary: Fundamental Constants

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## 1 Introduction

Physics can sometimes feel like a giant puzzle where we try to piece together the parts to understand the world. In this summary, I want to highlight the key ideas from my more comprehensive work on fundamental constants and theoretical physics, explaining them in simple language. It's about rethinking the basic building blocks of nature—like the speed of light, gravity, or quantum effects—and showing how they're interconnected, without delving into complex mathematics.

## 2 The Most Important Natural Constants

In physics, there are some numbers that seem like fixed rules of nature. They determine how everything works, from the flight of a ball to the behavior of tiny particles. The most important include the speed of light  $c \approx 300\,000\text{ km s}^{-1}$ , regarded as the universe's maximum speed; Planck's constant  $h$ , a tiny number that controls behavior in the quantum world; the gravitational constant  $G$ , which defines the strength of gravity; and the fine-structure constant  $\alpha \approx \frac{1}{137}$ , which describes how strongly electrically charged particles interact. These constants aren't arbitrary—they appear deeply embedded in the structure of nature.

## 3 Natural Units

Why do physicists sometimes set  $c = 1$  or  $\hbar = 1$ ? It might sound strange at first, but it's a smart way to simplify things. Imagine measuring distances in “car hours” instead of kilometers—then a car's speed would just be “1 car hour per hour.” Similarly, physicists measure distances in light-seconds, making the speed of light  $c$  equal to 1. This makes calculations clearer, reveals natural relationships between quantities like time, length, and energy, and helps uncover the true essence of physical laws. In the T0 model I've developed, we take it further, viewing these constants as expressions of a single quantity: energy, as outlined in “Time-Mass Duality Theory” [1].

## 4 The Most Exciting Ideas from the Original

### 4.1 Everything is Connected

One of the most fascinating insights is that these natural constants aren't independent of each other. Planck's constant  $h$  can be derived from electromagnetic properties, the fine-structure constant  $\alpha$  is tied to other constants, and all physical quantities can be expressed as ratios to so-called Planck units—like the Planck mass or Planck length. This suggests that nature might be far simpler than our complex formulas sometimes imply. In the T0 model, these connections are leveraged to create a more unified view of physics, as demonstrated in “Parameter Derivations” [1].

### 4.2 Physics Beyond the Speed of Light?

The original document poses an intriguing question: What if our physical laws only hold up to a certain limit? Einstein says the speed of light is the absolute upper bound—nothing can go faster. But could there be new rules beyond that threshold? Hypothetical particles called tachyons, which travel faster than light, are discussed in theory. While the T0 model stays within the speed of light, it prompts us to consider such possibilities and question the limits of our knowledge, as hinted at in “Dynamic Mass of Photons” [4].

### 4.3 Rethinking Time

Time is a central focus in the T0 model, and I introduce two new perspectives. In the “ $T_0$ -model,” time remains constant ( $T_0$ ), while mass varies—unlike relativity, where time is stretchable and mass stays fixed. A second idea is “intrinsic time,” where each particle has its own timescale based on its mass:

$$T(x) = \frac{\hbar}{\max(mc^2, \omega)} \quad (1)$$

These concepts, elaborated in “The Necessity of Extending Standard Quantum Mechanics” [5], aren't contradictions to relativity but alternative interpretations of the same observations. Where Einstein sees time dilation, I see mass variation—both explain the same phenomena, just from different viewpoints.

## 5 Why This Matters

These ideas aren't just exciting for physicists—they suggest that nature might be simpler and more unified than we realize. They open new avenues to address challenges like linking quantum mechanics and gravity and encourage us to question the boundaries of our understanding. The T0 model provides a fresh perspective that could help us comprehend the world more clearly, as suggested in “Mass Variation in Galaxies” [2] and “Measurement Differences” [3].

## 6 Differences from the Original Document

This summary is intentionally simpler than the original. Complex mathematical formulas—like the detailed derivation of constants or dimensional analysis—have largely been

omitted, and I focus instead on the core ideas. Rather than offering proofs, I explain the concepts in a way that's accessible without deep expertise. The emphasis is on conveying the essence of the ideas, not technical details.

## 7 Conclusion

The physics we know may be just part of a larger picture. Natural constants are more intertwined than we often assume, and our notions of time, mass, and energy might need a realignment. The T0 model reveals exciting possibilities that extend beyond known limits—whether it's the speed of light or our traditional theories. It's a sign that physics still holds many discoveries, even in the most fundamental things we think we understand.

## Literatur

- [1] Pascher, J. (2025). [Time-Mass Duality Theory \(T0 Model\): Derivation of Parameters  \$\kappa\$ ,  \$\alpha\$ , and  \$\beta\$](#) . April 4, 2025.
- [2] Pascher, J. (2025). [Mass Variation in Galaxies: An Analysis in the T0 Model with Emergent Gravitation](#). March 30, 2025.
- [3] Pascher, J. (2025). [Compensatory and Additive Effects: An Analysis of Measurement Differences Between the T0 Model and the  \$\Lambda\$ CDM Standard Model](#). April 2, 2025.
- [4] Pascher, J. (2025). [Dynamic Mass of Photons and Its Implications for Nonlocality in the T0 Model](#). March 25, 2025.
- [5] Pascher, J. (2025). [The Necessity of Extending Standard Quantum Mechanics and Quantum Field Theory](#). March 27, 2025.