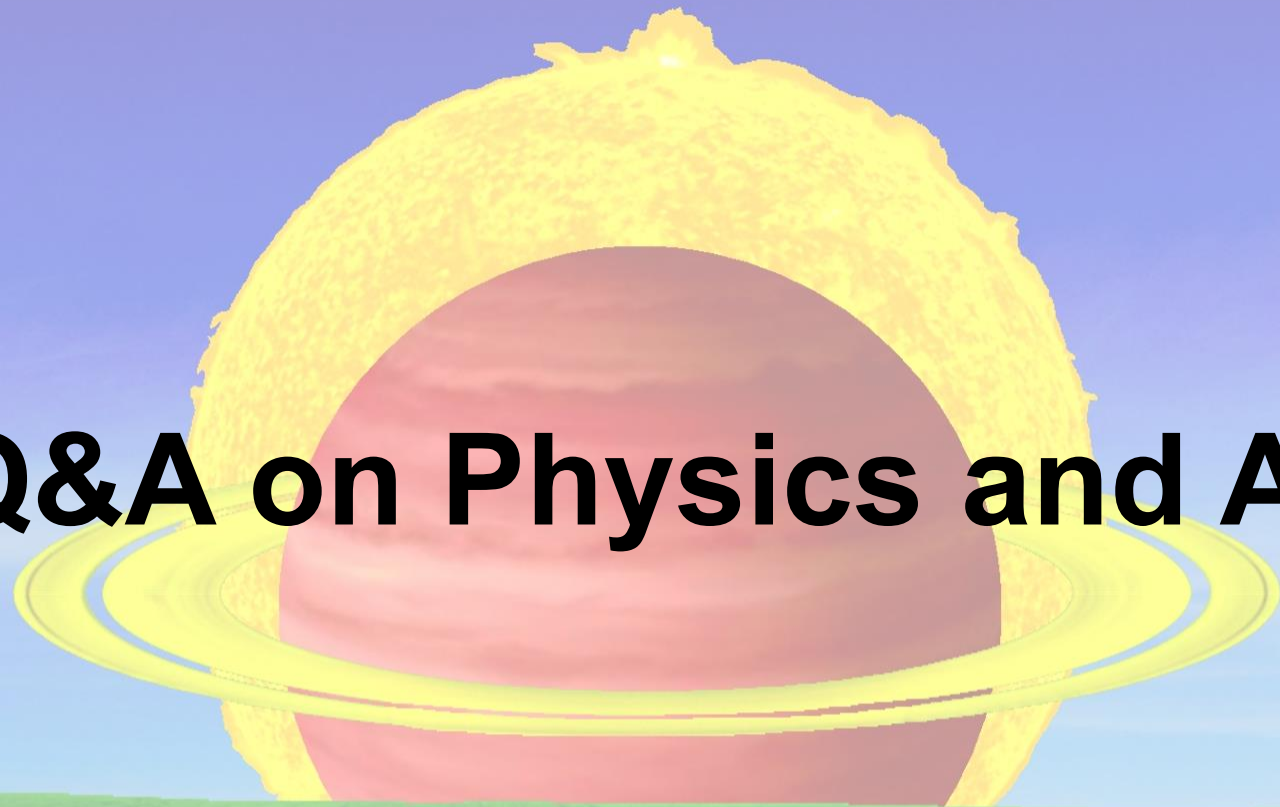




Q&A on Physics and AI

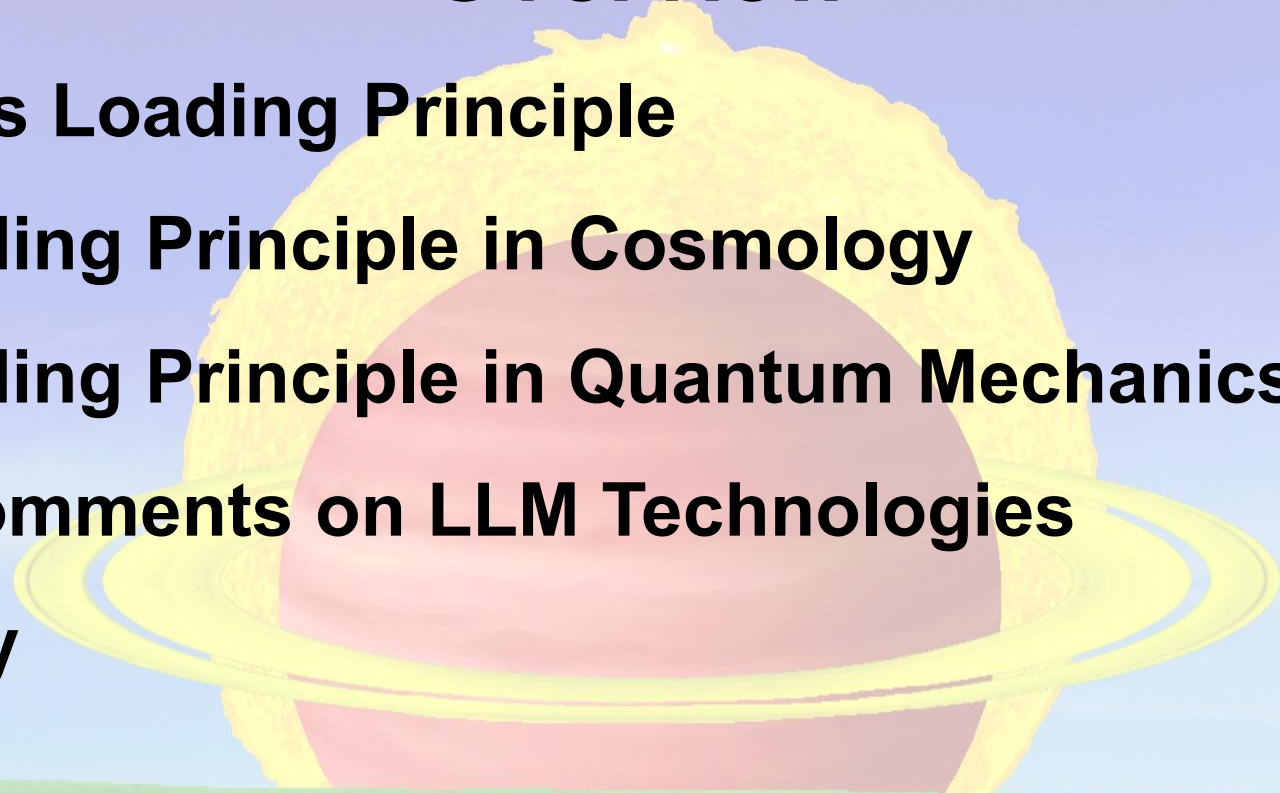
Presented by: Terry Bollinger (Apabistia Press)

Presented at: **Washington DC Quantum Computing Meetup (on OrionX YouTube)**

July 18, 2026

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Overview

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- I. Einstein's Loading Principle**
 - II. The Loading Principle in Cosmology**
 - III. The Loading Principle in Quantum Mechanics**
 - IV. Quick Comments on LLM Technologies**
 - V. Summary**

Objectives of Today's Talk

- Goal: **List some topics** in theoretical physics and artificial intelligence that have **promise for future research**
- Deep-dive starting topic that drives my assessment:
 - ☐ How **Einstein developed a novel method** to predict the Twins Paradox
 - ☐ How this **loading principle** converts many mathematical “paradoxes” in physics theory into extremely precise experimental predictions
 - ☐ How his loading principle **allows existing highly successful mathematical models to take on new meanings** by including loading constraints
 - ☐ Impacts of the loading principle on **cosmology**
 - ☐ Impacts of the loading principle on **quantum mechanics**
 - ☐ The curious issue of **why Einstein's loading principle was lost**
- **For AI**, the message is simple: **Data compression is not cognition**



Part I. Einstein's Loading Principle

The Loading Principle: Einstein's Forgotten Insight

- Before 1911, **everyone, including Einstein, assumed** that since time dilation appears identical to all observers, **clocks that traveled and returned should read the same as clocks that stayed home**
- Einstein startled everyone, including himself, when **he developed a new analytical approach that predicted clock differences**
- His **prediction was later verified** by multiple experiments that showed fast-moving systems to have *testably* slower time

REF: A. Einstein, *The Theory of Relativity*. Naturforschende Gesellschaft, Zürich, Vierteljahresschrift **56**, 1–14, [Jan. 16] (1911)

Original German journal version:

<https://archive.org/details/vierteljahrsschr56natu/page/1/mode/1up>

English translation with figures and his 1907 derivation of coordinate transformations added:

<https://sarxiv.org/ref.1911-01-16.figs.pdf>

Einstein's Loading of Clock Settings into $x'y'z'$

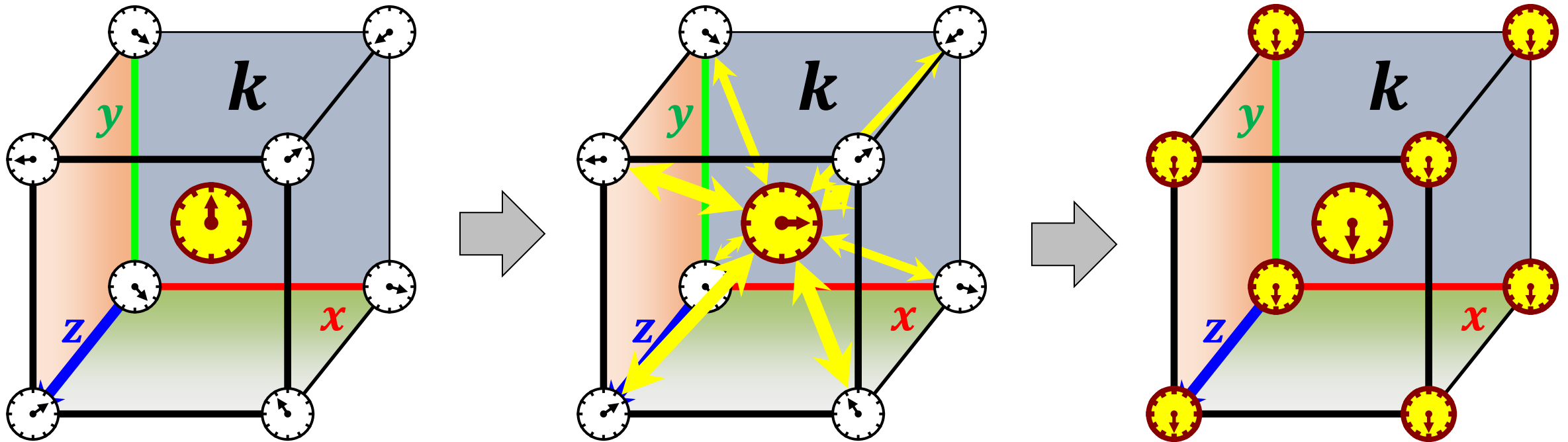
Einstein's insight: Until you **load a well-defined local volume** of the infinite abstract space $x'y'z'$ with **co-moving synchronized physical clocks**, t' cannot be measured:

Page 8: ... “We stipulate only this: The speed of light propagation in a vacuum from A to B is the same as from B to A . Thanks to this stipulation, **we can now add more clocks of the same type at various locations, all at rest relative to the system k** By enforcing this constraint, we obtain a way of determining time that a physicist can apply practically: The time of an event is equal to the time given by whichever previously adjusted coordinate clock is closest to the event. ... **To give event times a very specific meaning, one must apply the rule of setting clocks by assuming equal light propagation times in both directions between any two clocks to a large number of clocks that are all at rest relative to a very specific coordinate system k** . That is, we have not obtained a definition of time *per se*, but only a definition of time relative to the coordinate system k — or, more precisely, with reference to the clocks arranged at rest relative to the coordinate system k .”

“We can, of course, **perform precisely the same operations if we have a second coordinate system k' that is in uniform motion relative to k** . We can **distribute another clock system over space relative to this coordinate system k'** , but in such a way that the clocks move with k' and are at rest relative to it. **We can then adjust these clocks at rest relative to k'** using the same rule given above. If we do this, **we get a new definition of time with respect to the system k'** .”

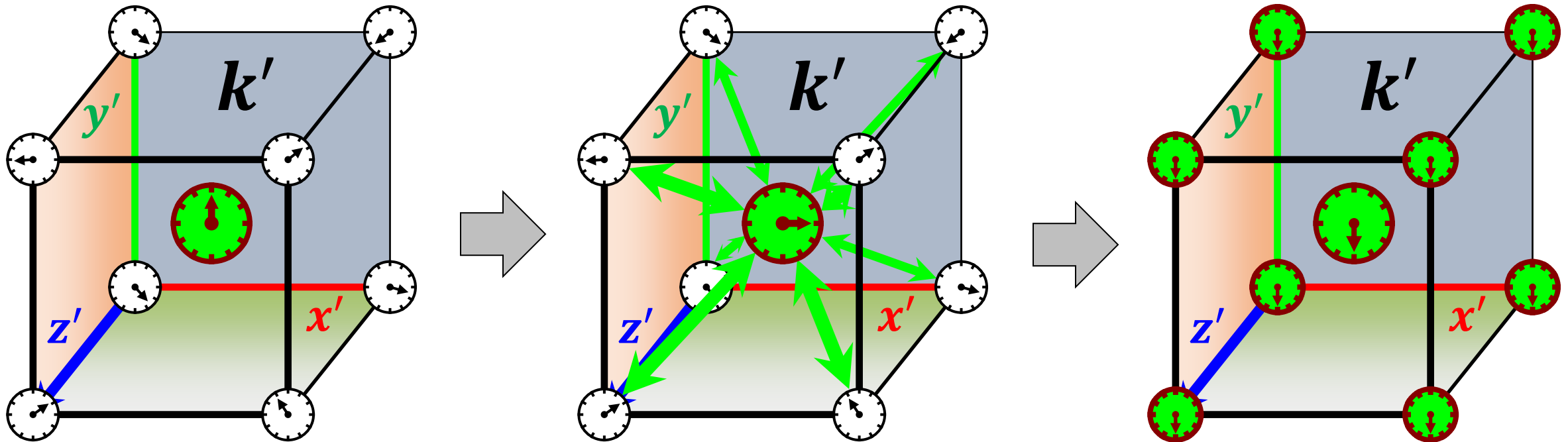
Einstein Clock Loading of the **Observer Frame**

- Einstein loading of the finite inertial-frame volume $k=[x,y,z]$ with an experimentally testable definition of space-like simultaneity for any moment on the t' axis:

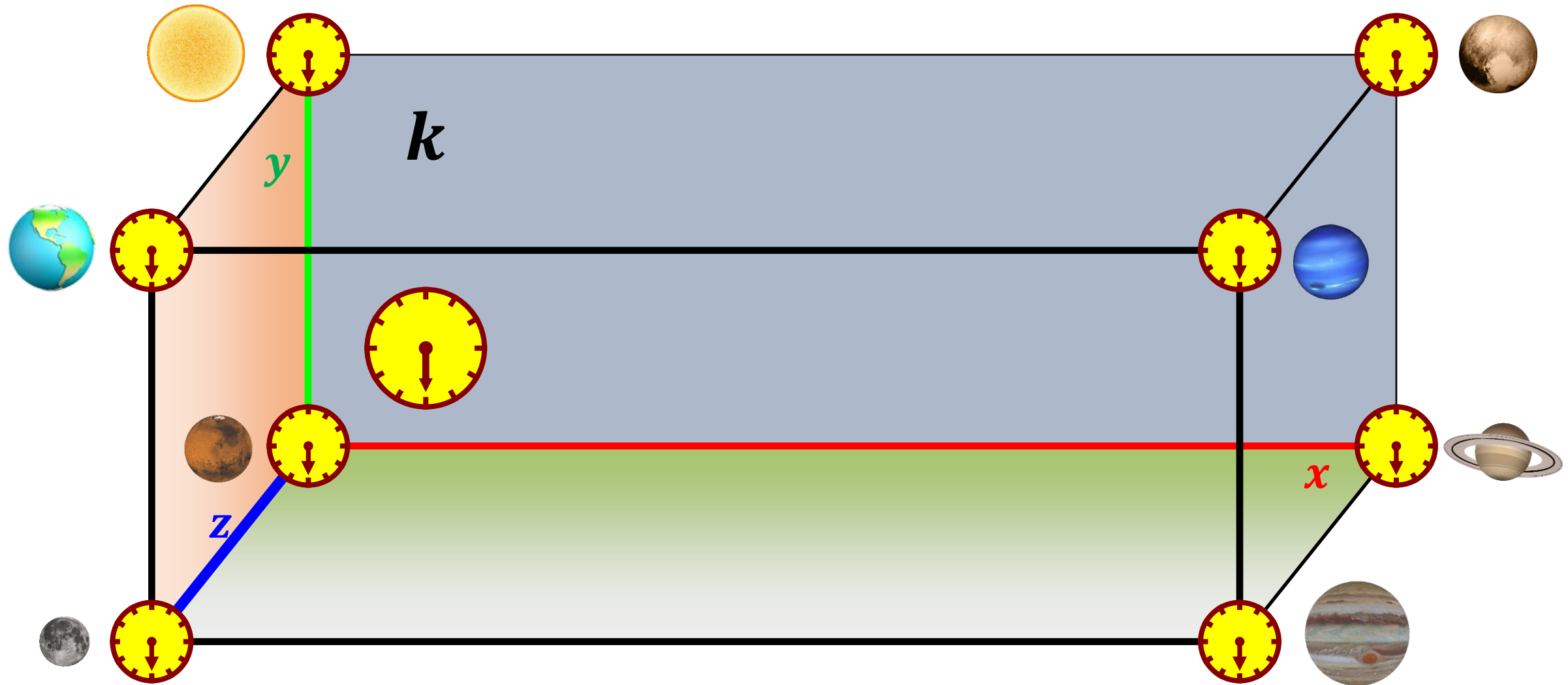


Einstein Clock Loading of an Accelerated Frame

- Einstein loading of a new inertial-frame volume $k'=[x', y', z']$ with an experimentally testable definition of space-like simultaneity for any moment on the t' axis:

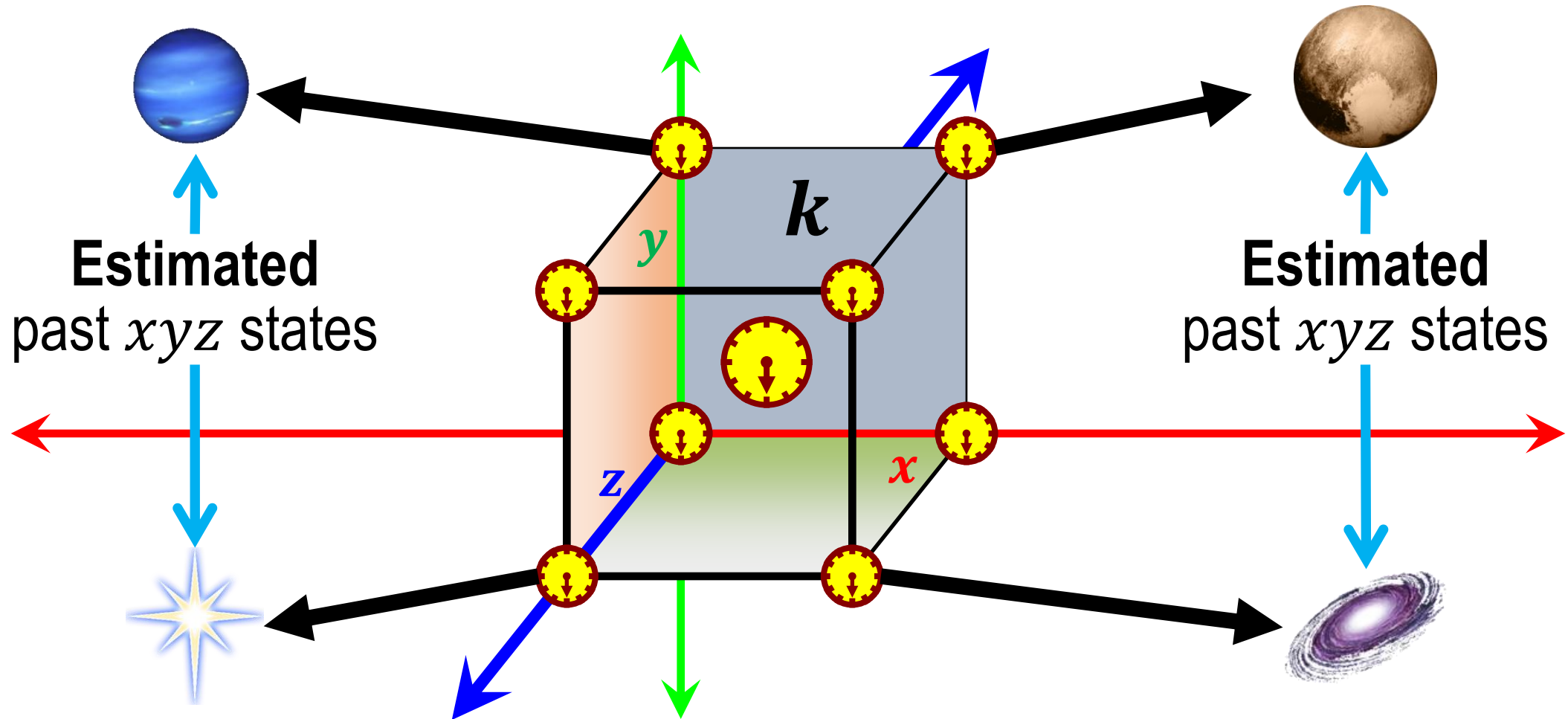


Example of a Very Large Pre-Loaded Observer Frame



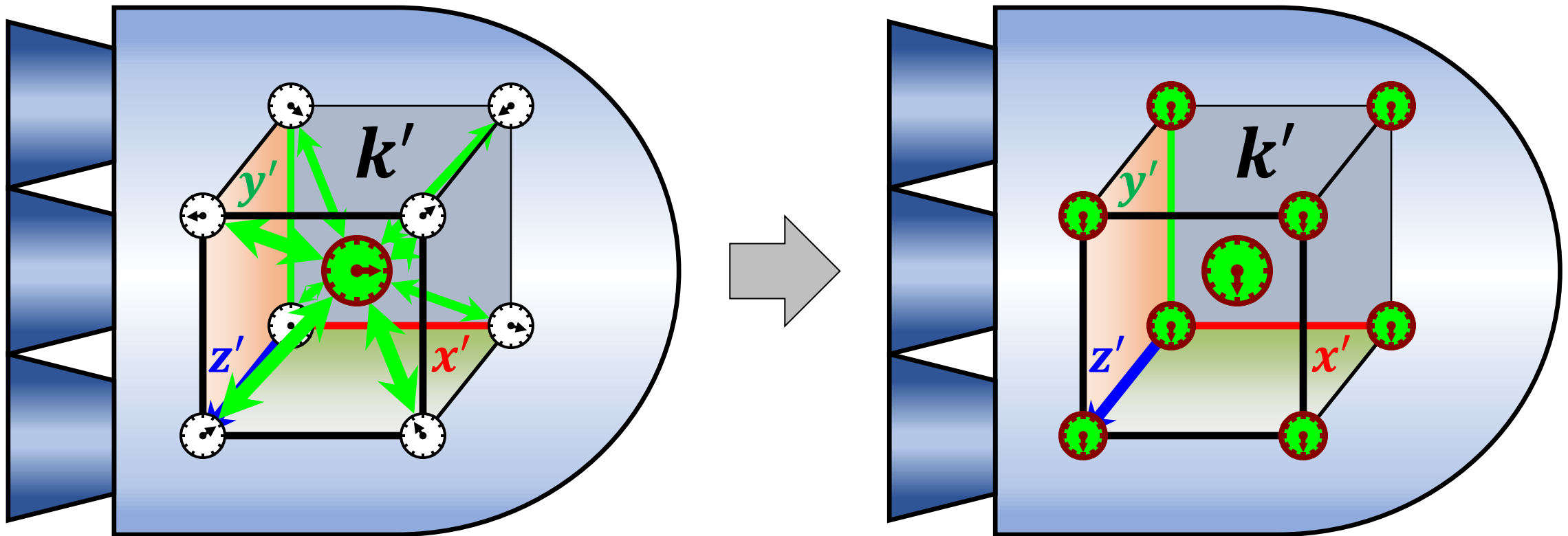
Proxy Loading for Distant But Predictable States

- Proxy loading creates local-only clock models for distant systems

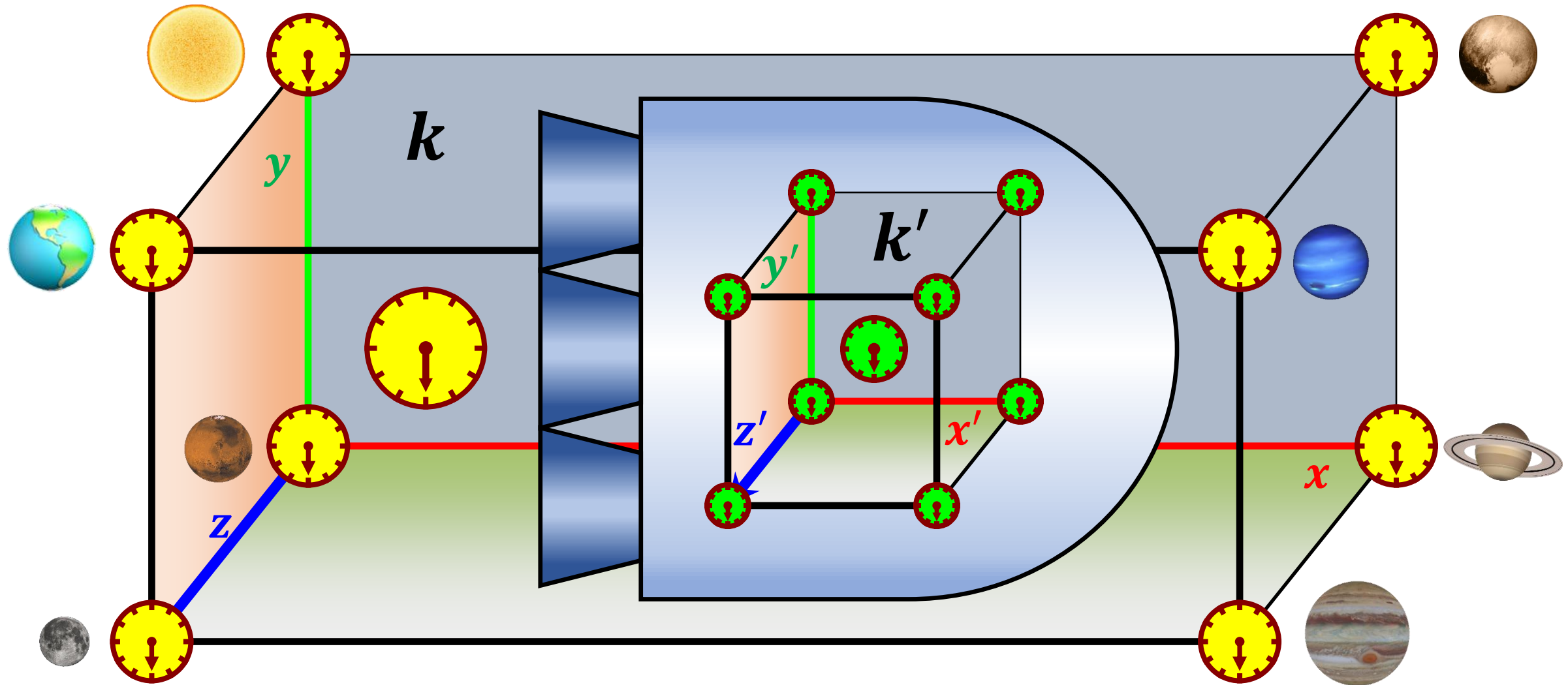


Acceleration *Always* Requires Clock Reloading

- The act of acceleration creates **time gradients** across earlier clocks

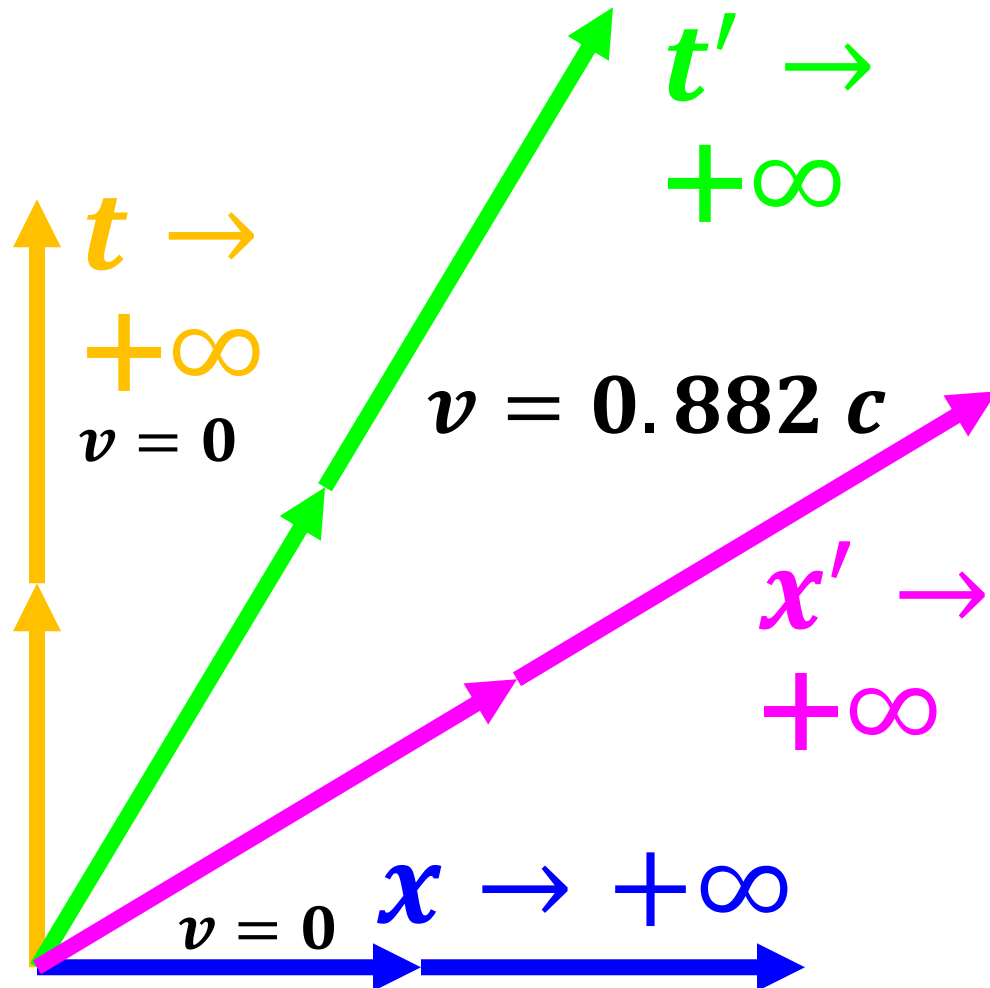


The Meaningful t' Volume of a Rocket is Very Small

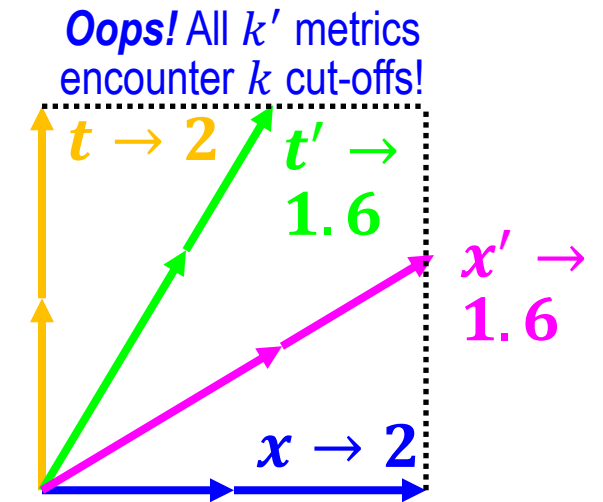
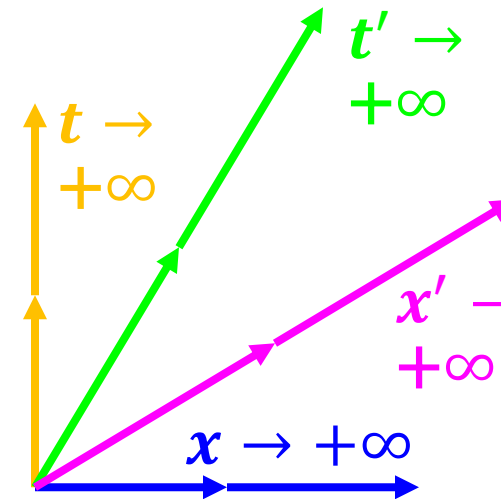
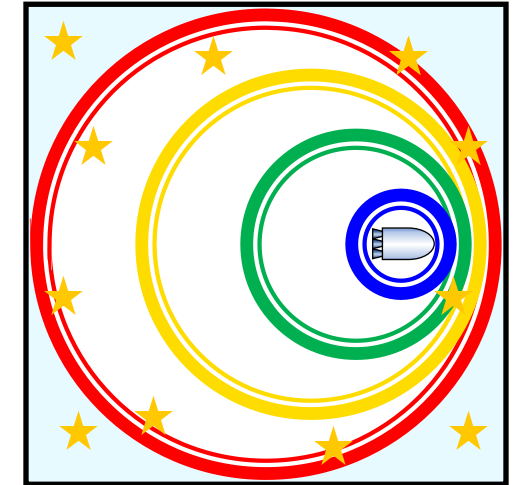
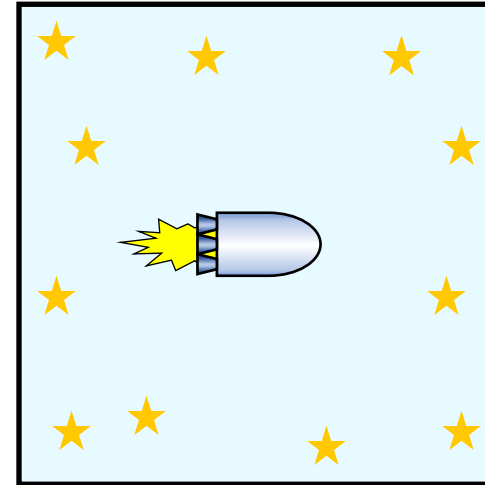


Frame Realism: The First Frame **Always** Dominates

$$k' = [x', y', z', t'] \text{ (infinite)}$$



k light cones *limit* loading of k'



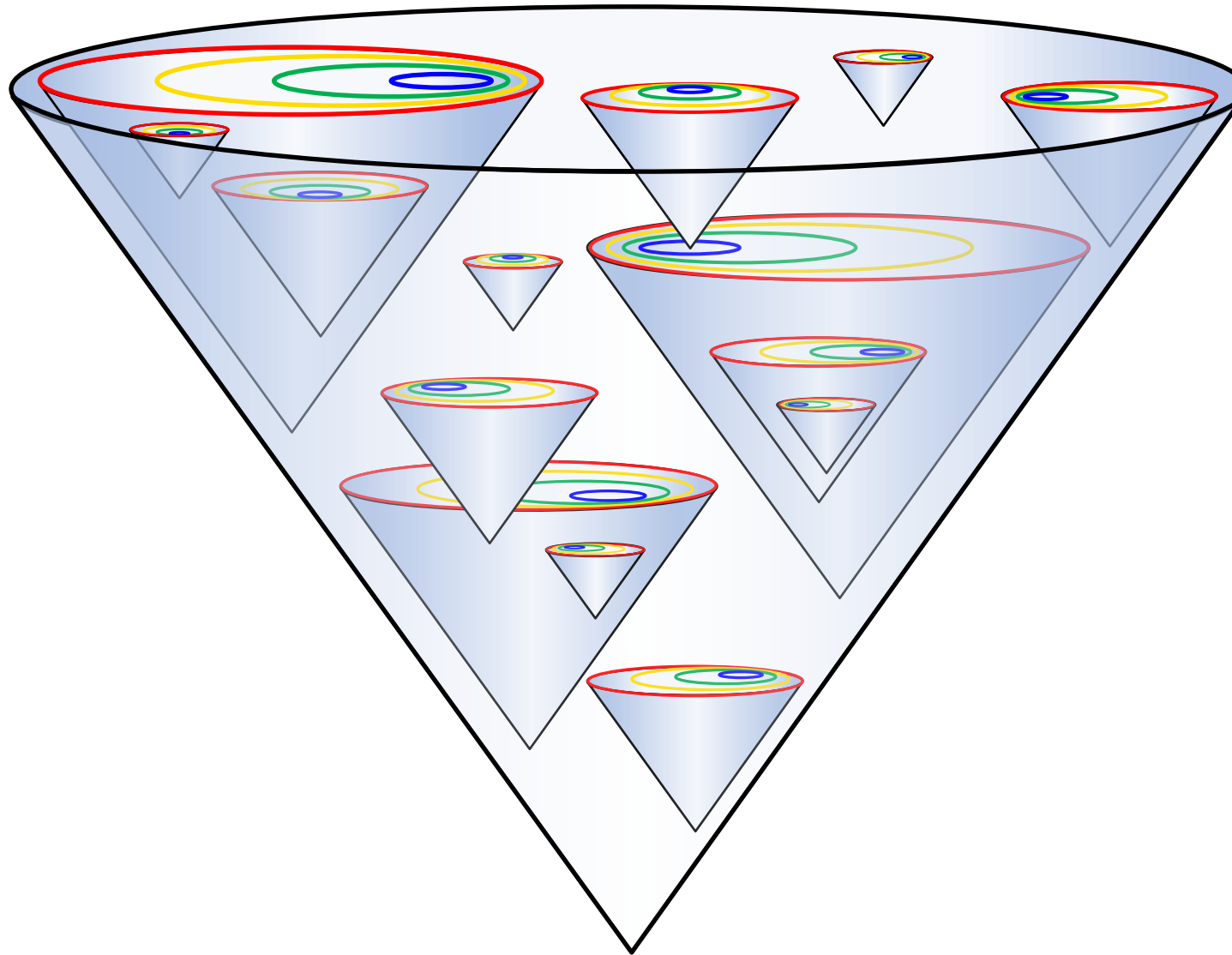
Oops! All k' metrics encounter k cut-offs!



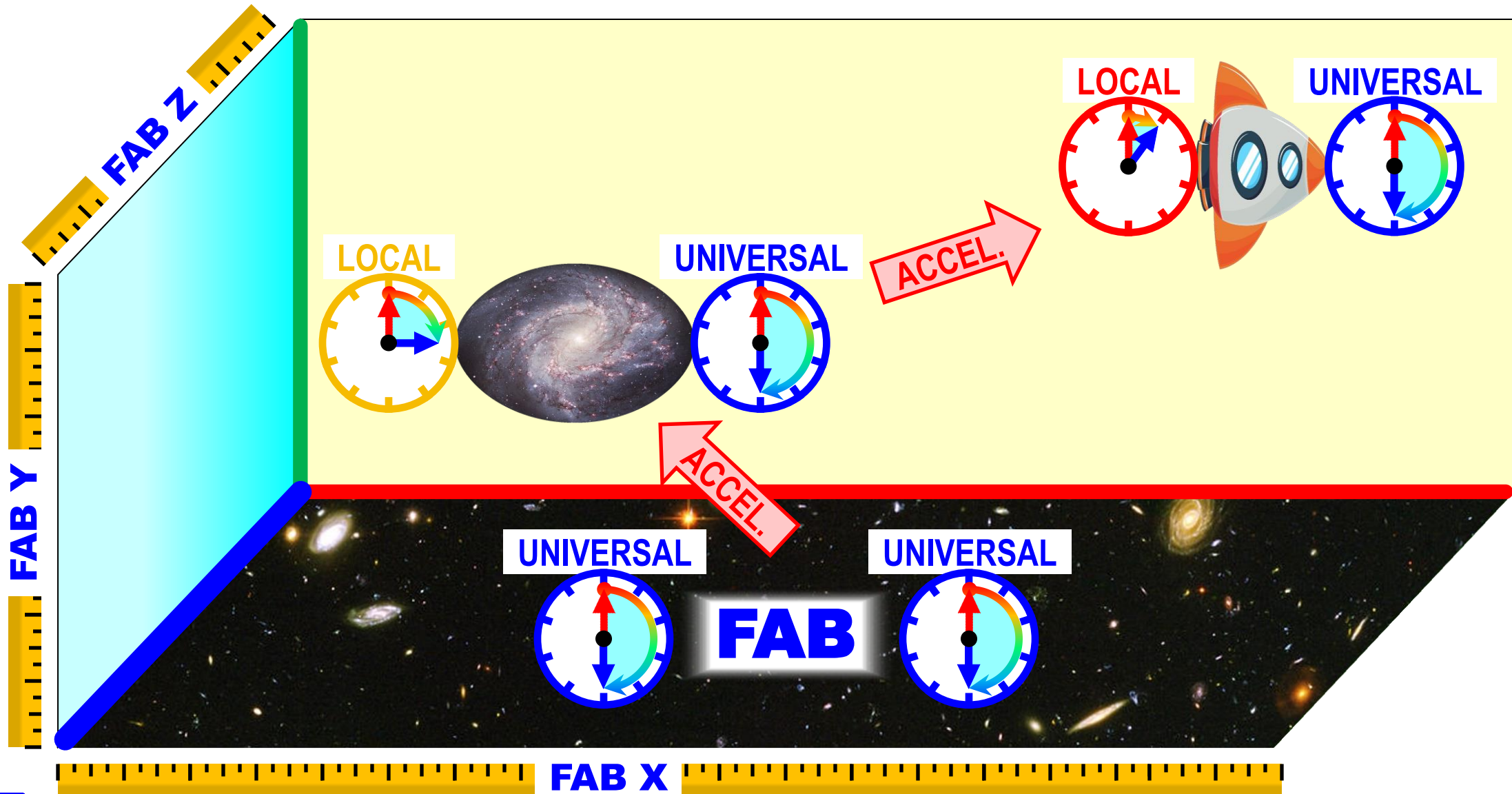
Part II.

The Loading Principle in Cosmology

Cones Within Cones: Fractal, Matter-Centered Spacetime

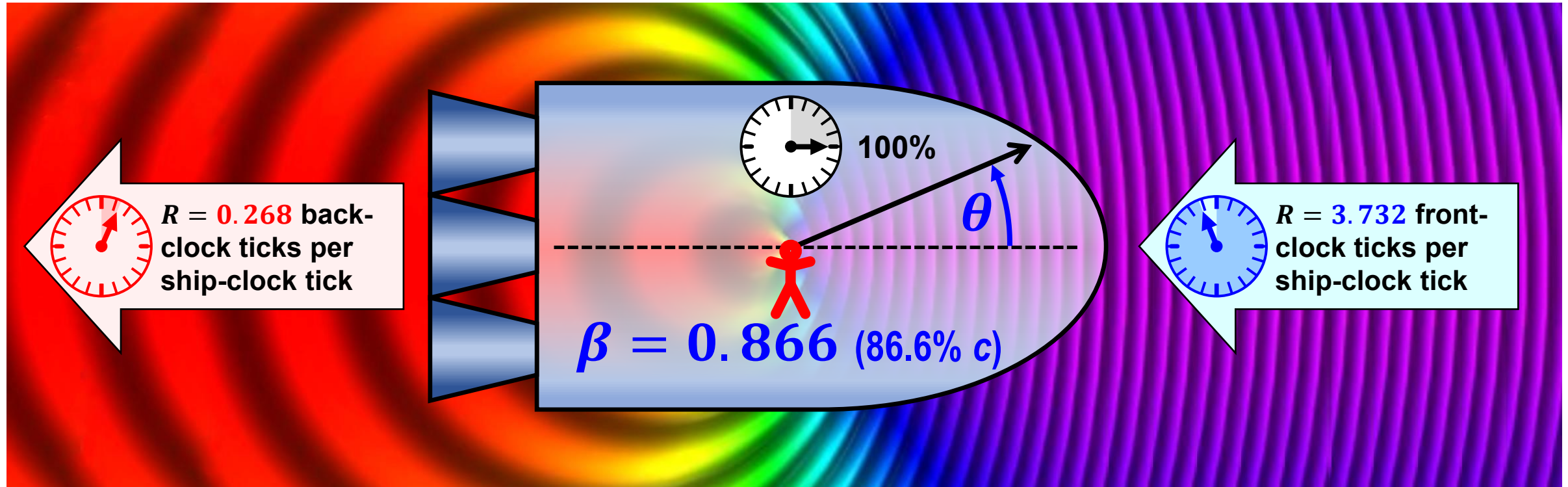


Universal First Ancestral Bubble (FAB) Coordinates



Locally Loaded Inertial Frames are **Never** Symmetric

- Outside the ship, time follows **Relativistic Doppler rules**
- The full equation is: $R(\beta, \theta) = \sqrt{1 - \beta^2} / (1 - \beta \cos \theta)$



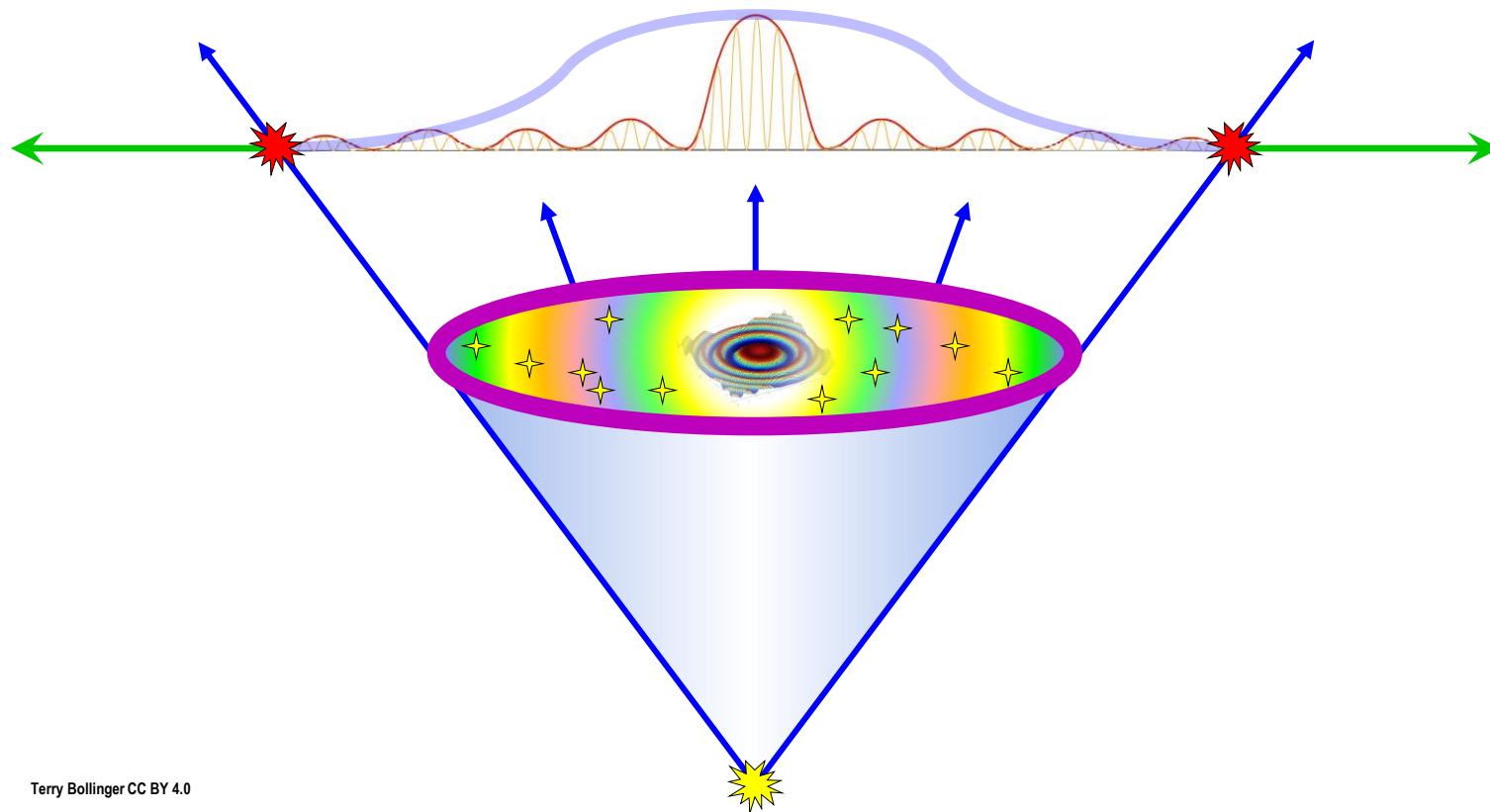
Relativistic Doppler background by TxAlien, CC BY-SA 3.0 (Wikimedia Commons)



Part III. The Loading Principle in Quantum Mechanics

Light Cones Are Natural Quantum-Wave Boundaries

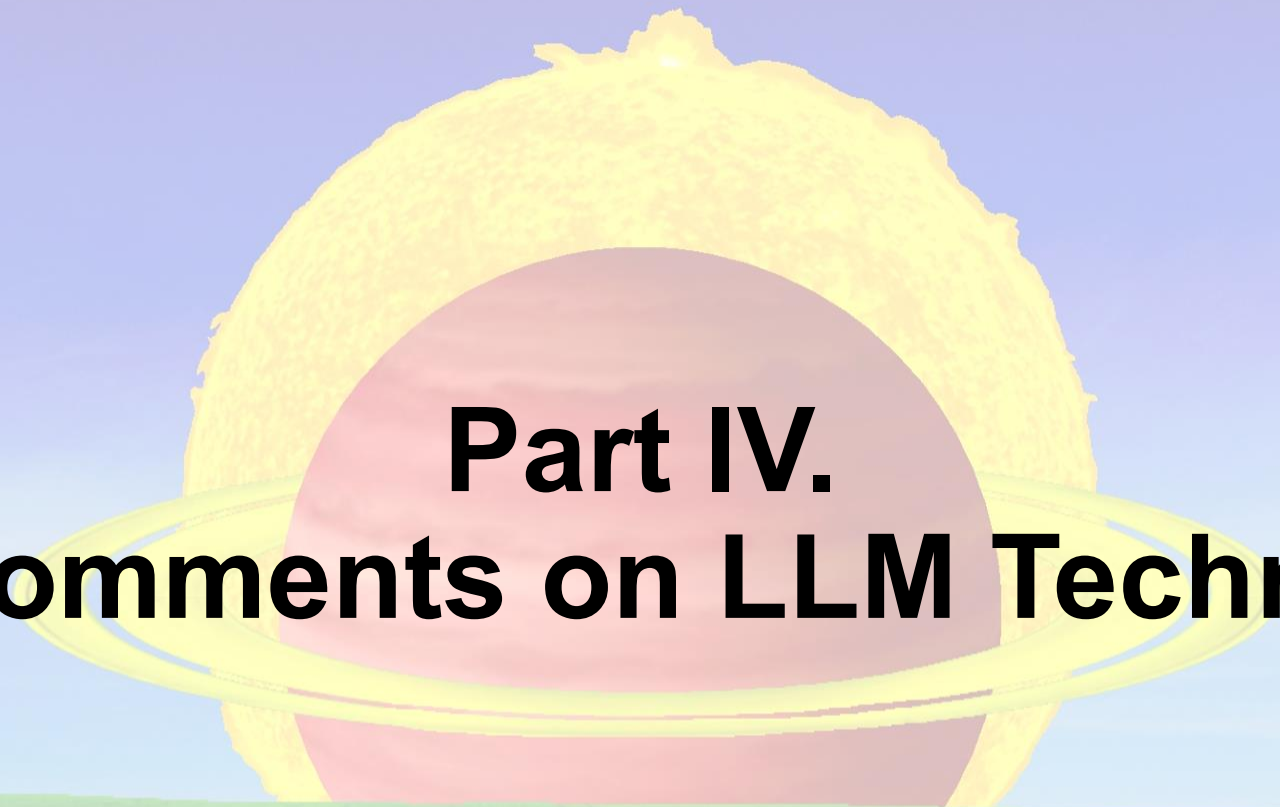
- Loading applies equally to the energy contents of wave functions
- Using infinite-volume “pure” states conflicts with light-speed limits



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Loading in Quantum Mechanics: Large Disruptions

- Constraining the loading of mathematical data structures to within the light cone is **devastatingly restrictive to many models**
- Example: **Many-Words Interpretation** must allow propagation time
 - ❑ Saying that “one event” splits the universe invokes finite propagation times
 - ❑ An event-triggered split would need to propagate throughout the universe
 - ❑ **MWI ends up as an experimentally meaningless concept before it begins**
- **Hilbert spaces**
 - ❑ Hilbert spaces of quantum states are necessarily **no longer** fundamental
 - ❑ **3D light cone propagation** instead **limits access to Hilbert space**
- **Universal wave functions** are no longer meaningful



Part IV.

Quick Comments on LLM Technologies

Large Language Models are Data Compressions

- They treat conversational data as the objects for compression
- The result can be incredibly convincing conversations
- The problem is that the conversations are no more real than TV images of ducks are identical to ducks: It's always superficial
- The effective reuse is where the real power resides, but...
- ... LLM always inserts noise and ends up undermining good reuse
- If you want to make LLMs faster and cheaper:
 - ❑ Abandon the Transformer path and focus on compression
 - ❑ Quality of axes is always critical
 - ❑ Fourier math is likely to be unbelievably more efficient
 - ❑ Hand-held optical databases are likely possible (but how useful?)
- **We do not understand the physics of low-energy cognition**



Part V. Summary

Summary

- **Einstein's powerful loading principle** opens up new ways to expand existing physics math theories by adding new limits, and provides a powerful tool for eliminating a variety of paradoxes
- Scary: We need to abandon length and duration as fundamental, and instead treat them as consistent dynamic behaviors of matter
 - ❑ Our reverence for distance and duration is rooted not only in their high value in classical physics, but because they are hard-wired into our neural systems as extremely efficient short-cuts for navigating the physical world
 - ❑ Alas: Since it is impossible to measure length or duration without matter (Einstein's clocks), the argument for deprecating their primacy is simple
- **Artificial Intelligence:** LLMs can be made far more efficient, but...
... we **must** stop confusing powerful data compression with intelligence
- New priority: Explore low-energy physics to understand cognition

