# AI & Physics: What is "Eureka"?

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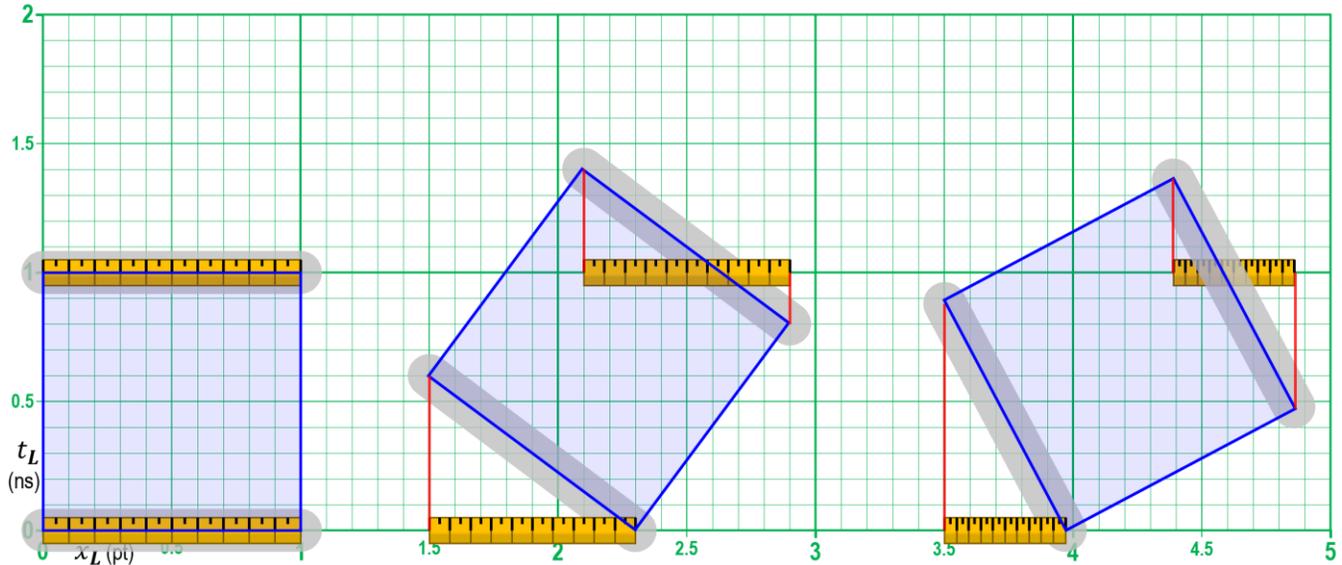


**Figure 1**. *LAB Euclidean Special Relativity block tilts for one-foot rulers at rest, 0.6 c, and 0.866 c.*

## An AI Perspective on a Eureka Moment

On Monday, July 28, 2025, I had a pleasant Eureka moment. It happened like this: Using a combination of well-known and lesser-known special relativity equations, I set about describing the one-nanosecond evolution of three one-foot objects at velocities of zero (rest), 60% lightspeed, and 88.2% lightspeed. I represented these events in a new Euclidean (not Minkowski) space in which every point represents a clock setting that physical objects must use if they wish to preserve the Poincaré symmetries of special relativity. The rulers represent differently moving physical objects within a single 3D space that moves smoothly upwards in time through the clock space. The above figure shows snapshots at zero and one nanoseconds of three objects embedded within this shared 3D space, with the horizontal axis showing only the direction of motion (e.g., *x*) to allow this simpler 2D representation.

Explicit separation of "clock setting" space from the motions of objects in this shared 3D space turns out to be surprisingly important. The surprisingly high complexity generated by using "mixed signature" (Minkowski) space to represent these same three objects collapses into a process of nothing more than tilting three identical unit squares. The degree of tilt then determines velocities, time dilation, length contraction, and (more surprisingly) internal clock divergence. More importantly, it tells precisely how the clocks in objects will read during *collisions* of such objects.

I did not expect this degree of simplification! All I could think when I saw the identical squares emerge, varying only by degree of tilt, was, "Now, how cool is that?" That, dear readers, is what Eureka is all about: An unexpected collapse into striking but fully explanatory simplicity.

## LLMs and Eureka Moments

Can LLM "chatbot" intelligence mimics generate this kind of Eureka moment, or, more realistically, assist humans in arriving at them? As I examine my own lengthy (years) process in arriving at this insightful tilted-block reformulation of Minkowski space, it's tough to see how an LLM could help much. The difficulty is that almost

every step of my process has consisted of constrained experimentation with new ideas, followed by ruthless cutting back and abandonment of interpretations that generated noise instead of insight. That is not how chatbots work.

The best I can come up with is that if you are not already immersed in the topic through deep research, an LLM may help in the micro-exploration steps by pointing out resources and ideas that are unfamiliar to you. The risk there is, as usual, sneaky addition of hallucinations that are unrelated to real physics, but at that level of becoming familiar with the territory, the risk is not great, especially if you follow that step by the critically important ruthless cutting back. That cutting-back stage, if done vigorously, can remove mild pattern-based hallucinations as easily as it can remove useless or low-value explorations. Thus, LLMs could provide value in exploration.

Where LLMs have their greatest difficulty is in cutting back ruthlessly. There is a reason why they call it "GenAI," even though it is not really AI: It *generates* possibilities based on past patterns. Cutting back is not its strength.

Conversely, that same weakness highlights what's needed to create artificial systems capable of insight: The ability to look at a large set of explorations and find the one or two threads most likely to be productive. In traditional AI, which dates back to the 1950s with the invention of LISP and neural networks, the concept of sorting through many possibilities is referred to as game theory. Such ideas were instrumental in creating the first computers capable of playing high-level chess. I first became interested in AI when I used such methods to create a simple, unbeatable tic-tac-toe program for what would now be called a very small programmable calculator (a Wang 600 calculator).

I assume that some of the research efforts into improving LLM performance recognize the importance of game-theory-style options reductions, though I have not checked the literature lately. I would assume that various efforts to reduce hallucinations fall into that category and use such methods. Whether digital versions of tree reduction can ever compete or even reach the very-low-energy biological version of it remains very much an open question. The smaller iterations of the Eureka process that I observed during the slow process to tilted-box special relativity feel very different from the clumsy and often fallible heuristics I see in game theory, including my own programming.

## Back to Physics

The value of LAB Euclidean redrawing of relativistic events goes well beyond the simplicity of tilting squares. The notorious Twins Paradox transforms into a precisely predictive sequence of tilt operations that leaves zero ambiguity about which components are time-dilated and Lorentz-contracted, and which are not.

These tilt operations create perfect Poincaré symmetries within each tilted object. There is nothing new in that, since that part is a subset of standard 4-vector analysis. However, unlike infinite-scale Minkowski space representations, the boundaries of these newly created Poincaré symmetries are strictly finite: They apply *only* to the finite "bubble" of matter participating in the tilt operation, and never invoke non-existent pasts or futures.

It's also recursive: You can start it over again within each unit by making that unit your new set of LAB Euclidean coordinates and tilting smaller units. Instead of a smooth continuum, spacetime becomes an immensely detailed branching tree of sets of matter creating local-only Poincaré symmetry regions.

What are the physics advantages? The most striking one is that the perceived need for a fully predetermined or "block" universe to reconcile an infinite number of universe-spanning Minkowski spaces, each with their own definition of causality, disappears. In its place, the mundane and very human concept of a universal "now" reemerges. How radical: Physics gets time back, instead of forcing folks to call it an illusion.

You also get small but potentially testable differences in predictions for particle accelerators (particles hitting unmoving objects) and colliders (particles hitting each other at identical speeds), and in topics such as how to synchronize and coordinate satellite systems.

Experimentally, the difference from Minkowski spacetime is that block tilts *always* provide a path for a simple and fully predictive interpretation of any complicated event. That path uses LAB Euclidean coordinates: The clock space of the Last Ancestral Bubble, meaning the last rest frame shared by all components before some of them were accelerated into new states. Earth surface coordinates are the most common LAB coordinates, and explain why particles in accelerators are universally time dilated. Interestingly, cosmic ray particles do not necessarily share Earth LAB coordinates, since the last common rest frame in that case may diverge significantly from Earth's motion. The largest and oldest LAB, the First Ancestral Bubble (FAB; think fabrication) coordinates should be approximately those of the Cosmic Microwave Background (CMB) inertial frame.

## What's Next

I'll post more details about LAB Euclidean special relativity later. A YouTube STEM channel has already generously offered to make a video on how Euclidean block tilt transformations work. I'll also include a version of this figure in a YouTube presentation (channel Terry Bollinger — sorry, I'm not very original on names). This was the last puzzle piece for that video.

I have several videos and papers on the fascinating history of how Einstein missed all of this through nothing more than making an extremely mathematically plausible — but incorrect — assumption that all Poincaré symmetric spaces in the universe share an origin. The delightful Monday, July 28, 2025, block-tilt insight is new, however.