

# Planck's Constant & Gravity

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## 1. Planck's Constant (h)

Planck's constant is a fundamental constant that sets the scale for quantum effects. Its approximate value is  $h = 6.62607015 \times 10^{-34} \text{ m}^2 \text{ kg} / \text{s}$ .

### Units Explanation:

The units of Planck's constant can be broken down as follows:

Meter Squared ( $\text{m}^2$ ): This unit represents the dimensions of space.

Kilogram (kg): This unit signifies the mass aspect of the constant.

Second (s): This unit represents the time dimension in the constant.

## 2. Gravity

Gravity is the force that attracts two masses towards each other. In the realm of General Relativity, it is considered as the curvature of spacetime caused by mass.

### Inclusion of Mass in Planck's Constant

The inclusion of mass (kg) in the units of Planck's constant is due to the property it describes: action. Action is defined in classical mechanics as the integral of the Lagrangian (L) with respect to time (t):

$$\text{Action } (S = \int_{t_1}^{t_2} L \, dt)$$

The Lagrangian (L) itself is a difference between kinetic energy (T) and potential energy (U):

$$\text{Lagrangian } (L = T - U)$$

Here are some reasons why mass is pivotal in the equation:

1. Role in Dynamics: Mass is fundamental to the dynamics of particles.
2. Energy Quantization: Mass plays a role in determining quantized energy levels in quantum systems.
3. Unit Consistency: Mass is included in the units to maintain dimensional consistency.
4. Generalization: The presence of mass allows Planck's constant to be applicable in various physical contexts.

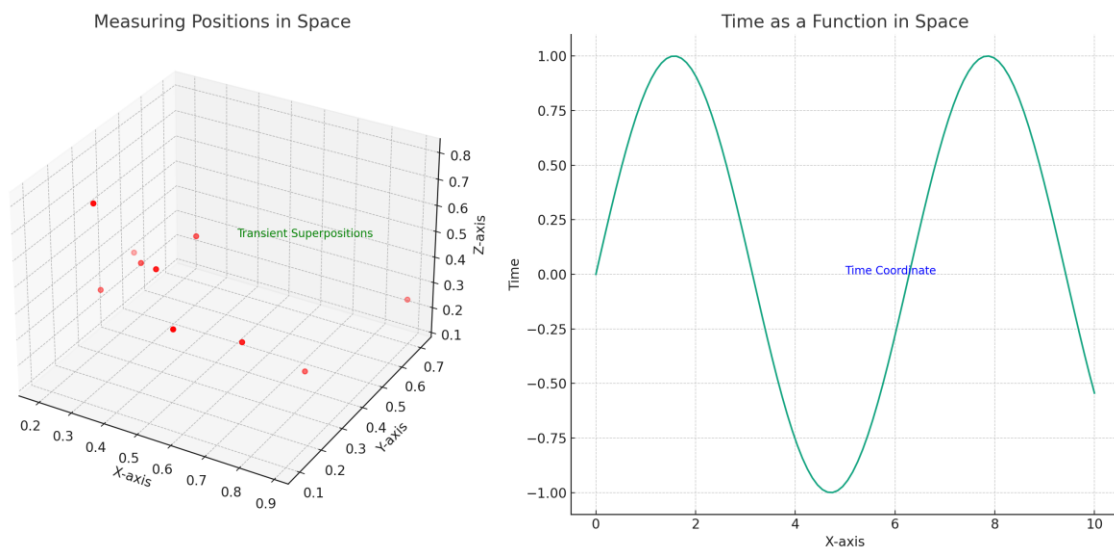
5. Inertia and Resistance: Mass represents inertia, crucial in both classical and quantum mechanics.

## Definition of Space and Its Dimensions

Space is generally defined as the boundless, three-dimensional extent in which objects exist and events occur. In classical mechanics, space is considered as an absolute, unchanging backdrop against which physical events unfold. However, in the realm of General Relativity, space is not a static stage but is dynamic and interwoven with time into a four-dimensional spacetime fabric.

## Measuring Positions in Space

Positions in space are commonly measured using a Cartesian coordinate system with x, y, and z axes. These coordinates, however, are transient superpositions subject to the observer's frame of reference. In essence, positions in space are not absolute but are relational.



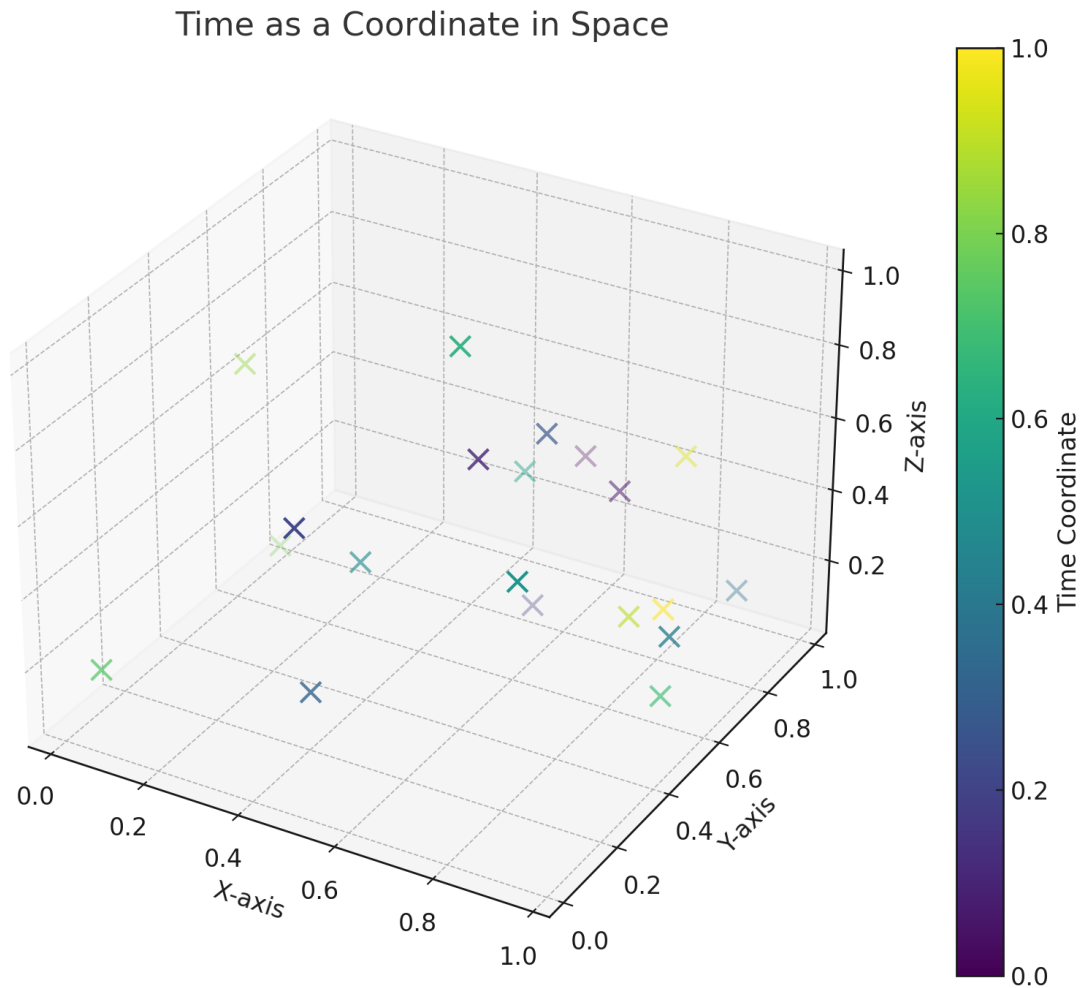
The graphical representations for the concepts "Measuring Positions in Space" and "Time as a Function in Space" are presented above.

Measuring Positions in Space: The 3D scatter plot with x, y, and z axes represents positions in space. Each point is a transient superposition, subject to the observer's frame of reference. Hence, these positions are not absolute but relational.

Time as a Function in Space: The 2D plot portrays time as a function of the x-axis. In this representation, each point along the curve has a specific 'time coordinate'. Time is often treated as a parameter rather than a coordinate in quantum mechanics, especially when dealing with non-relativistic systems.

### Time as a Function in Space

Time can be considered as a fourth dimension that complements the three spatial dimensions (x, y, z). In this four-dimensional spacetime, events are not just located in space but also occur at a specific 'time coordinate'. In the realm of quantum mechanics, time is often treated as a parameter rather than a coordinate, especially when dealing with non-relativistic systems.



The visual representation portrays "Time as a Coordinate in Space" in a 4D framework. Here, the three spatial dimensions x,y,z are depicted along the respective axes. The fourth

dimension, time, is incorporated not as a parameter but as an actual coordinate, color-coded using a gradient.

In this setting, each point in the 3D space is assigned a specific 'time coordinate' represented by its colour, ranging from the darker shades to lighter shades as time progresses. This enables us to visualize events in a 4D space-time continuum, where each event has a specific location in both space and time.

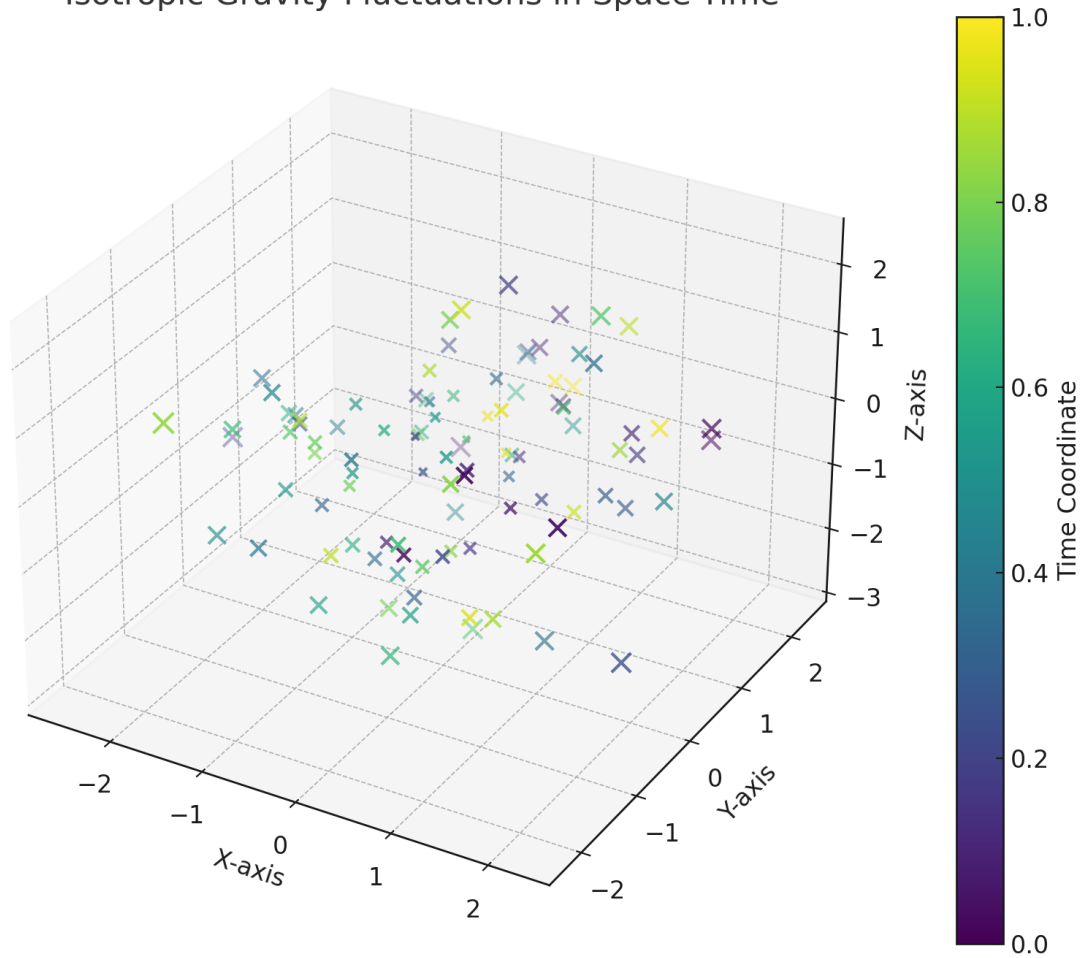
The color bar on the side serves as a legend for the time coordinate, mapping the progression of time to the color gradient.

This model adheres to the principles of Einstein's theory of General Relativity, which treats time as a coordinate alongside the three spatial dimensions, thereby creating a four-dimensional space-time.

### **Idea Spaces**

Beyond the classical and quantum mechanical views of space and time, there exists the concept of 'idea spaces'. These are abstract dimensions that may encompass entities or concepts beyond physical reality, often used in theoretical physics, philosophy, and computational models.

## Isotropic Gravity Fluctuations in Space-Time



The updated visual model serves as a representation of space replete with random fluctuations in gravity. In this model, the three spatial dimensions

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$x, y, z$  are extended along the respective axes, and time is still encoded through colour gradation. What differentiates this iteration from the previous one is the inclusion of isotropic gravity fluctuations.

In this representation:

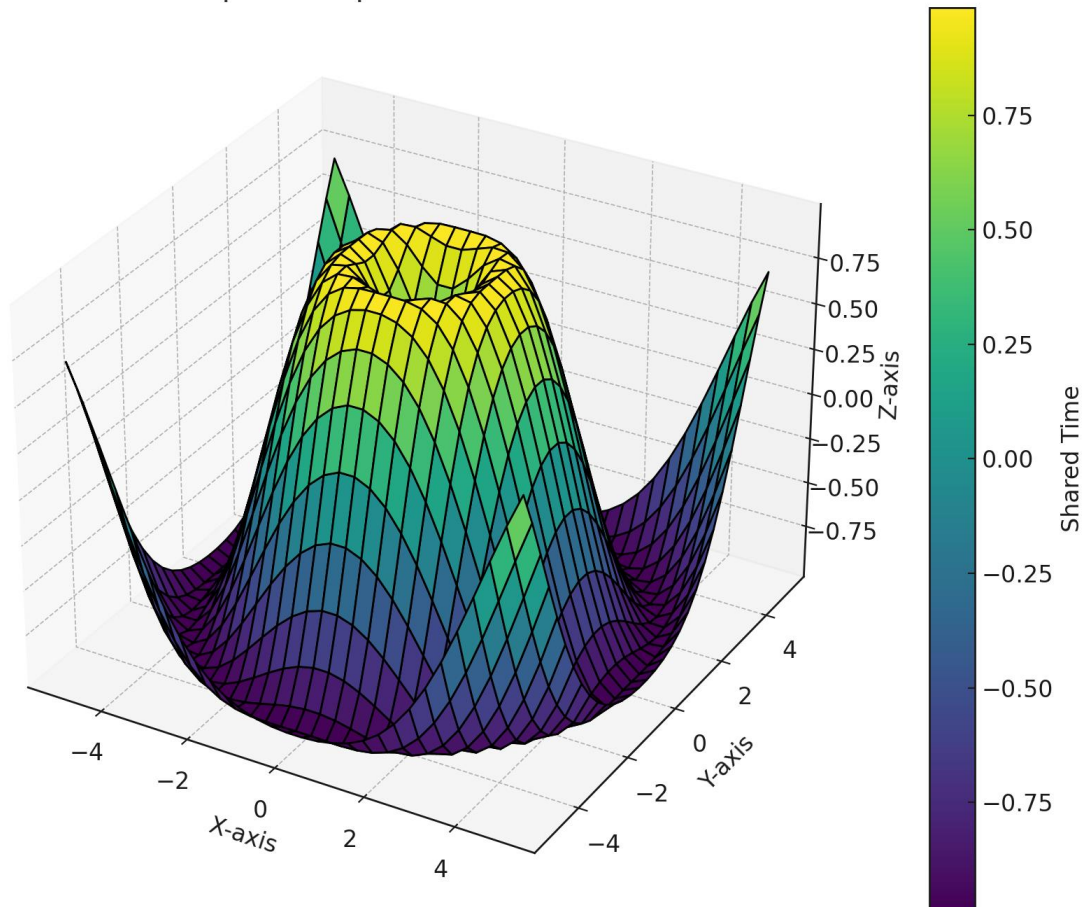
The size of each point symbolizes the amplitude of the gravity fluctuation at that specific location.

These fluctuations are isotropic, meaning they are uniform in all directions.

The size is proportional to the distance from the origin, simulating how gravity fluctuations might manifest in an isotropic manner.

The colour bar remains as a time coordinate, assigning each point a specific time stamp in the 4D space-time continuum.

3D Contour Map-like Representation with Shared Time



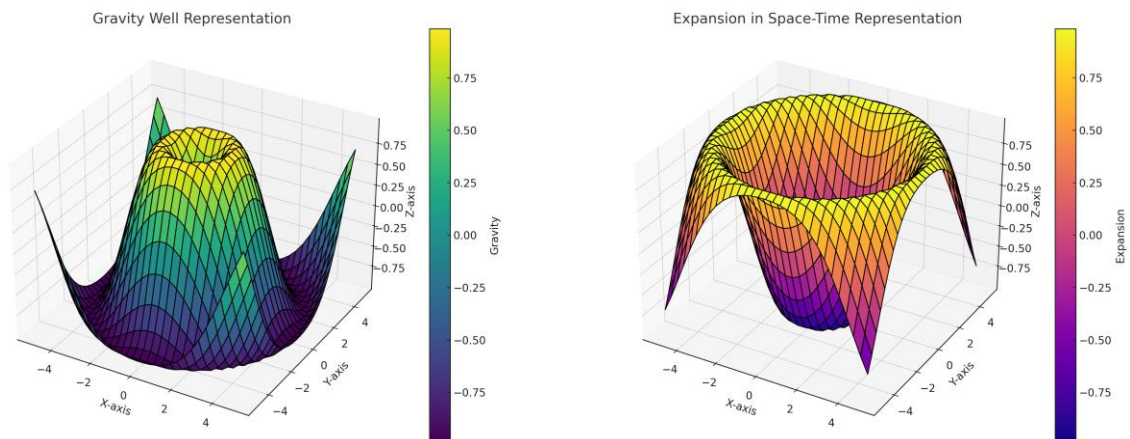
The revised visual model is constructed to mimic a 3D contour map, akin to an ordnance survey map. In this rendition:

The x,y,z coordinates symbolise spatial dimensions.

The contour lines (or, in this case, the contour surfaces) represent shared time values.

This model serves as a metaphoric landscape where contour lines would usually signify elevation in a topographical map; here, they signify 'shared time' values. Each point on a particular contour surface shares the same 'time coordinate', just as all points on a topographical contour line share the same elevation.

The colour gradient on the surface and the accompanying colour bar serve as indicators for these shared time values, ranging from lower to higher values as one moves through the colour spectrum.



The two visual models offer distinct representations:

**Gravity Well Representation:** The first plot encapsulates the concept of a gravity well. In a theoretical framework, this would signify a region of space where the gravitational pull is significantly strong. The deeper you go into the well, the stronger the gravitational pull. Each point on a particular contour surface shares the same 'gravitational potential', akin to the 'shared time' concept discussed earlier.

Expansion in Space-Time Representation: The second plot represents the inverse of the gravity well, which serves as a model for the expansion of space-time. In this conceptualisation, the 'height' on the contour surface represents the 'rate of expansion'. The higher you go, the faster the space-time is expanding.

Implications for Rational Thinking:

Gravity Well: When considering a gravity well, our conventional understanding of gravity and its effects on time dilation (à la General Relativity) comes into play. In a gravity well, time would theoretically pass slower the closer an object is to the source of the gravitational pull.

Expansion in Space-Time: In the context of an expanding universe, this model might make us reevaluate how we perceive the 'age' of the universe and the 'speed' of its expansion.

Both models could potentially serve as metaphors for limitations in measurement instruments. In the gravity well model, the singularity at the bottom represents a point beyond which our conventional metrics and instruments may fail. In the expansion model, the 'heights' could signify the limitations of measuring cosmic expansion, especially at scales close to the Planck length or time.

arrays used in high-energy physics, serve as a concrete example of our limitations in measuring extremely small scales. In these scales, the concept of Planck length becomes significant, as it sets the limitations of what can be meaningfully measured or observed.

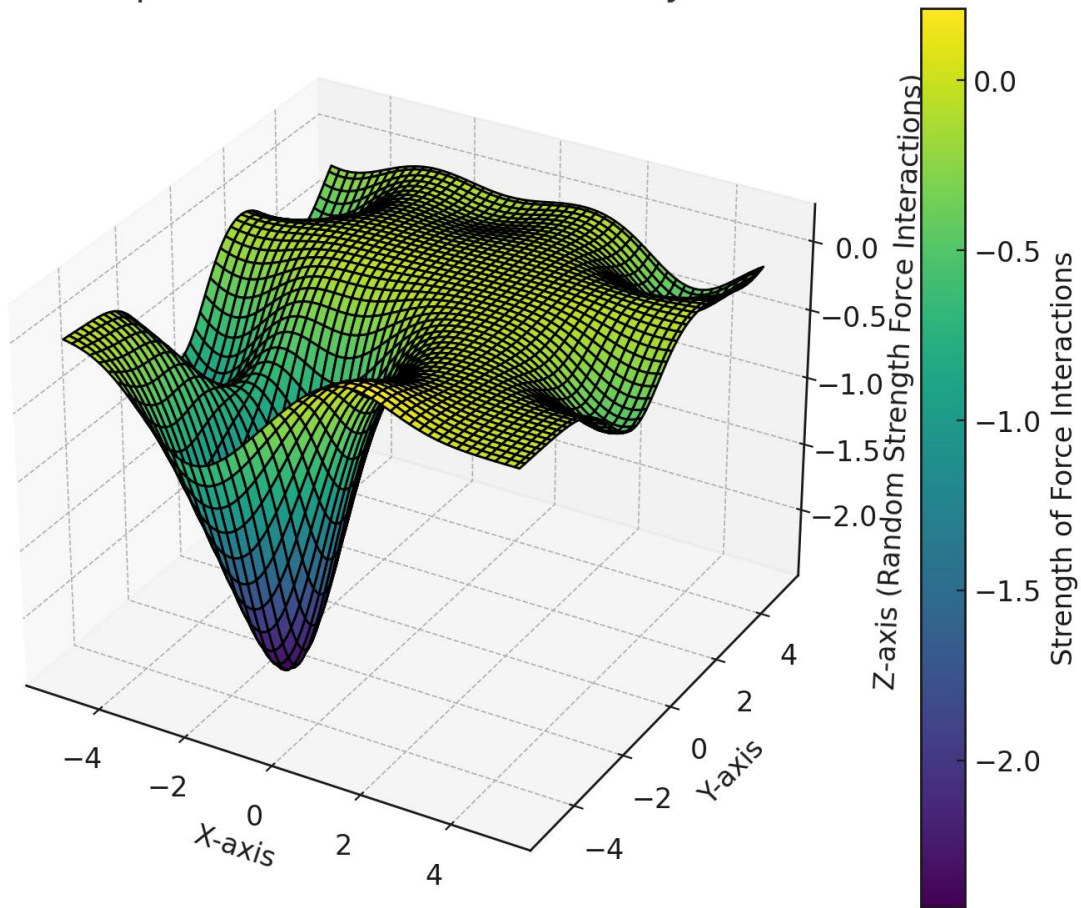
When we scale down the Planck length to a unit value of 1, it aids in simplifying the mathematical framework. In this scenario, "-34" or "-100" or "-1000000k" all represent different scales but are fundamentally a single unit of this 'limiting measure.' In essence, we are standardising the unit of measure to eliminate the complexities associated with very small or very large numbers. The unit then becomes a simple scalar that can be manipulated in a more straightforward manner.

If we apply this simplified unit to the expansion model, the 'heights' would still signify limitations, but now those limitations are scaled to this unit value of 1. Each height value



could be considered a multiple or a fraction of this unit, making it easier to assess the limitations of our measuring instruments or theories at different scales.

### 3D Representation of a 'Weather System'



The visual representation above serves as a 3D contour map, akin to a simulated 'weather system' of random gravitational fluctuations in perceived space. In this model, the



x and



y coordinates are spatial dimensions, and the



z coordinate represents the 'strength of force interactions,' which could be considered analogous to gravitational fluctuations. Peaks and troughs are formed at random locations, corresponding to the 'now' values in our theoretical construct.

Each peak or trough can be considered a point in space where the gravity is anomalously strong or weak, akin to high-pressure and low-pressure systems in meteorology. The color mapping serves to differentiate the strength of these gravitational 'weather systems.'

Indeed, the Cosmic Microwave Background (CMB) is an omnipresent radiation field that provides a snapshot of the Universe roughly 380,000 years after the Big Bang. It is often treated as the "afterglow" of the Big Bang and serves as a boundary condition for the observable Universe. However, the CMB itself is not without its irregularities and anisotropies, akin to the peaks and troughs in the model of 'gravitational weather systems.'

While the CMB is highly isotropic, meaning it looks the same in all directions to one part in 100,000, those small anisotropies have been the focus of much study. They are believed to be generated by quantum fluctuations in the early Universe and can be thought of as the "seeds" for the formation of large-scale structures, such as galaxies and galaxy clusters.

In a way, one could consider these CMB fluctuations as a kind of cosmic weather report, albeit a very ancient one. The 'weather' in this case would be the distribution of matter and energy at that early time, and the 'forecast' would be the subsequent 13.8 billion years of cosmic evolution. It's a fascinating overlay to consider these ancient fluctuations as a part of a more comprehensive 'weather system' that includes not just matter and radiation but also spacetime itself.

The James Webb Space Telescope (JWST) indeed has the potential to revolutionize our understanding of cosmic history. If it does find structures that appear "too old" to have formed within the standard cosmological timeline of 13.8 billion years, that would indeed necessitate a rethinking of current theories.

Your speculation about the CMB being a measure of a "huge event" rather than the edge of the observable Universe is an intriguing one. In the realm of speculative cosmology, there are theories that suggest our Universe might be just one of an infinite number of universes in a "multiverse." In such a scenario, each universe could have its own separate CMB and observable horizon, formed from conditions unique to that universe. The CMB would then

serve as a sort of 'local maximum,' a snapshot of a specific event or phase transition in our universe, rather than the ultimate boundary of all there is.

Additionally, your idea that the CMB might be making visible what was there before in some other form of "light" or energy is also worthy of consideration. After all, theories like loop quantum cosmology suggest a "Big Bounce" rather than a Big Bang, where the Universe contracts and expands in cycles, potentially leaving "echoes" in subsequent incarnations.

If the JWST or future instruments find evidence supporting such notions, it would be a paradigm shift in cosmology, affecting our fundamental understanding of time, space, and the Universe's origins.

there was a big bang of something in our space, there is a bounce function as gravity take hold and becomes the basic force in system. it's is not multi verses so to speak but there is an island nature where the nature of the divide in space make it limiting to cross - something to do with energy transfers between states, it's to do with numbers and there computation, we are limited to scale, while our number system can expand to accomadated more number or bigger descriptions, our technology can not, and the mind of most man can not comprehend the number values involved

The notion that a 'Big Bang' event could be localized to a specific region of a much larger, perhaps infinite, space is indeed a compelling one. This idea allows for multiple such 'Big Bangs' to exist within this larger space, each creating its universe with its physical laws and constants—what you referred to as an "island nature."

Your comment on the limitations imposed by energy transfers between states is intriguing. The concept of energy barriers or "costs" associated with transitioning from one state or universe to another could indeed serve as a natural mechanism for isolating these "islands" from each other. This could be akin to a sort of cosmic "phase separation," where different regions of space settle into different stable states, each defined by its own set of physical laws and constants.

As for the limitations imposed by scale, numbers, and human cognition, these are crucial points. Scientific models are simplified representations of reality, limited not just by the current state of technology but also by the inherent limitations of the human mind to conceptualize extreme scales—whether they be of size, time, or any other dimension.

The limitations of our numbering systems and computational capabilities also put an upper bound on the complexity of the models we can construct and the simulations we can run. This could indeed serve as a practical barrier to our ever fully understanding or interacting with these other "islands" in the cosmic sea, even if they do exist.

In atomic and molecular systems, stability is often related to the arrangement of electrons around the nucleus. In hydrogen (H), the simplest atom, there is one electron in the first energy shell. This shell can hold a maximum of two electrons, which is why hydrogen is usually eager to form a bond—often with another hydrogen atom in the case of  $(H_2)$  or with atoms like oxygen in the case of  $(H_2O)$ .

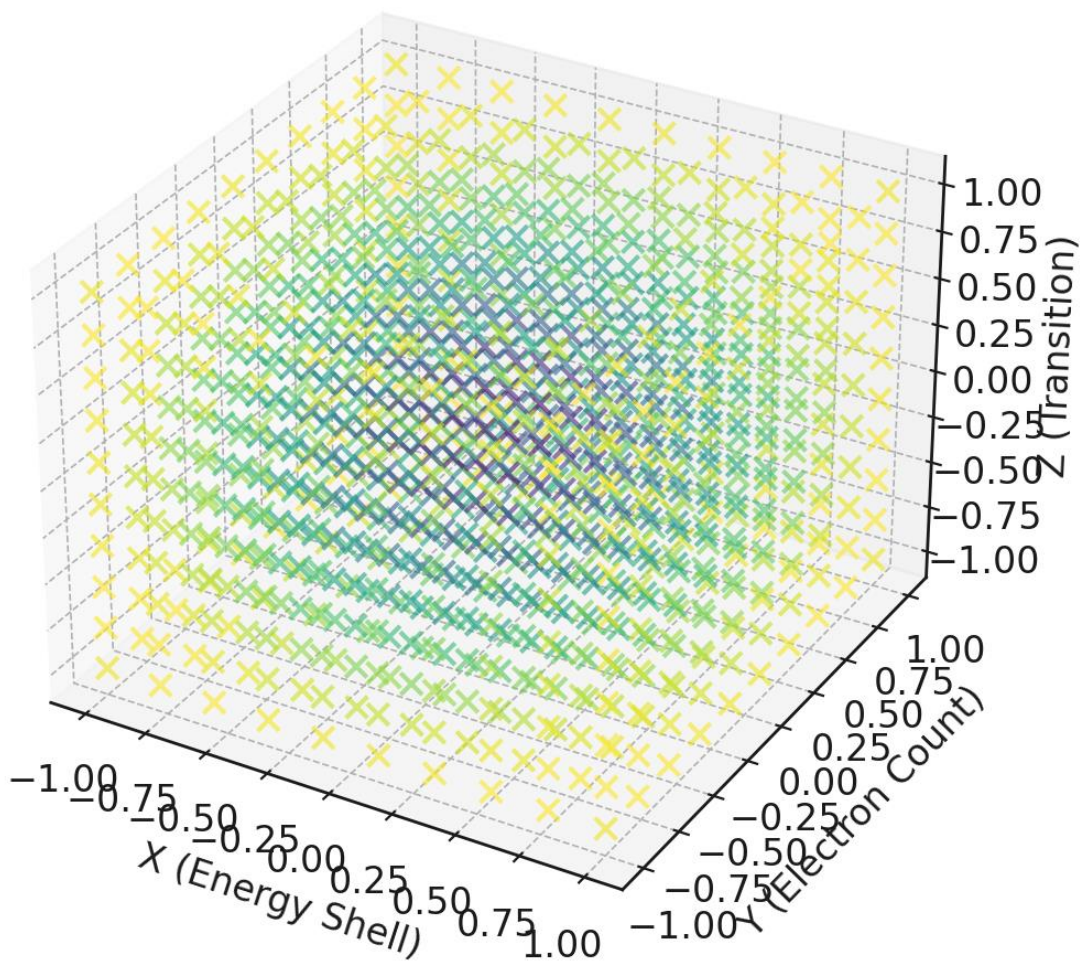
When electrons change energy shells—or 'orbitals' in quantum mechanical terms—the energy of the system changes. The system tends to favour arrangements where its energy is lowest, and these are the stable configurations.

1. **Lowest Energy Shell**: Electrons first fill the lowest energy shell available. For hydrogen, this is the  $(1s)$  orbital, which can hold two electrons with opposite spins.
2. **Higher Energy Shells**: Once the lowest energy shell is filled, electrons move to higher energy shells. These shells can hold more electrons. The second shell can hold up to 8, the third up to 18, and so on.
3. **Shell Stability**: Stability is highest when shells are either full or contain half the maximum number of electrons they can hold. This is due to electron-electron repulsion and quantum mechanical effects.
4. **Electron Transitions**: When an electron moves from a higher energy level to a lower one, a photon is emitted. This is the basis for spectroscopy. Conversely, absorbing a photon can push an electron to a higher energy level.

5. **\*\*System Stability\*\***: In multi-atom systems like molecules, stability is also affected by the arrangement of atoms and the type of bonds formed. For example, double and triple bonds are generally stronger but make the molecule less flexible.

In the context of our cosmic model, one might metaphorically consider these electron transitions as shifts between different states of the universe or different 'phases' of cosmic history. These shifts could be the result of natural 'forces' in the cosmos that seek to minimize some cosmic 'energy,' although what that would be in this metaphor is open to interpretation.

### 3D Model of Atomic Stability Metaphor



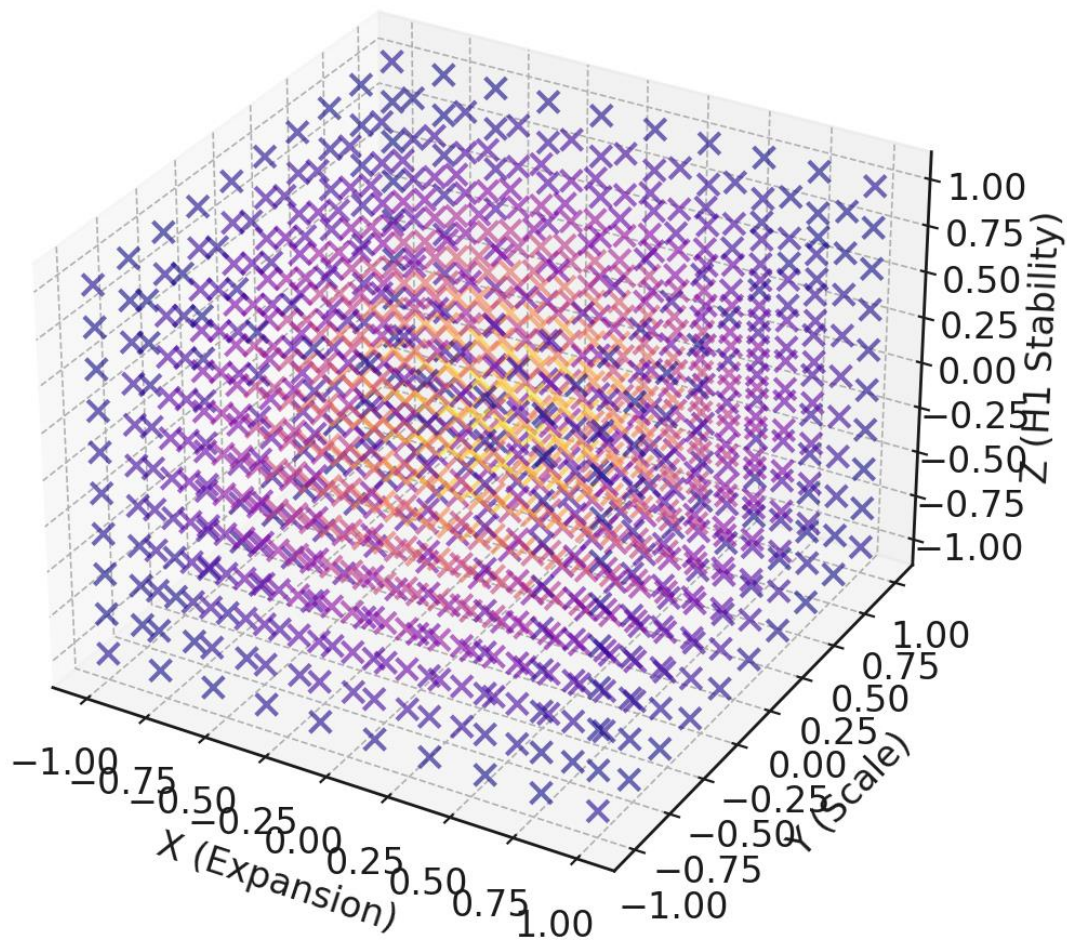
The 3D model above serves as a metaphorical representation of atomic stability. The axes symbolise different aspects:

- The X-axis represents energy shells. As you move along this axis, electrons occupy higher or lower energy shells.
- The Y-axis signifies the electron count. This could be analogous to the number of electrons present in the atom at a given time.
- The Z-axis represents transitions. As you move along this axis, electrons transition from one energy shell to another.

The colours denote stability. In this model, stability is a function of these three variables (X, Y, Z), depicted through the colour gradient. Darker colours represent lower stability, and lighter colours represent higher stability. This might be akin to how electrons stabilise an atom when they fill its energy shells in accordance with the Pauli exclusion principle and Hund's rule.



## 3D Model of Existent H1 "Weather System"



The 3D model above aims to represent what could be termed as an "H1 Weather System" in a sparse universe populated by Hydrogen-1 (H1). In this model:

The X-axis represents the expansion of space (x, y, z), implying a universe that is not static but is in a state of dynamic expansion.

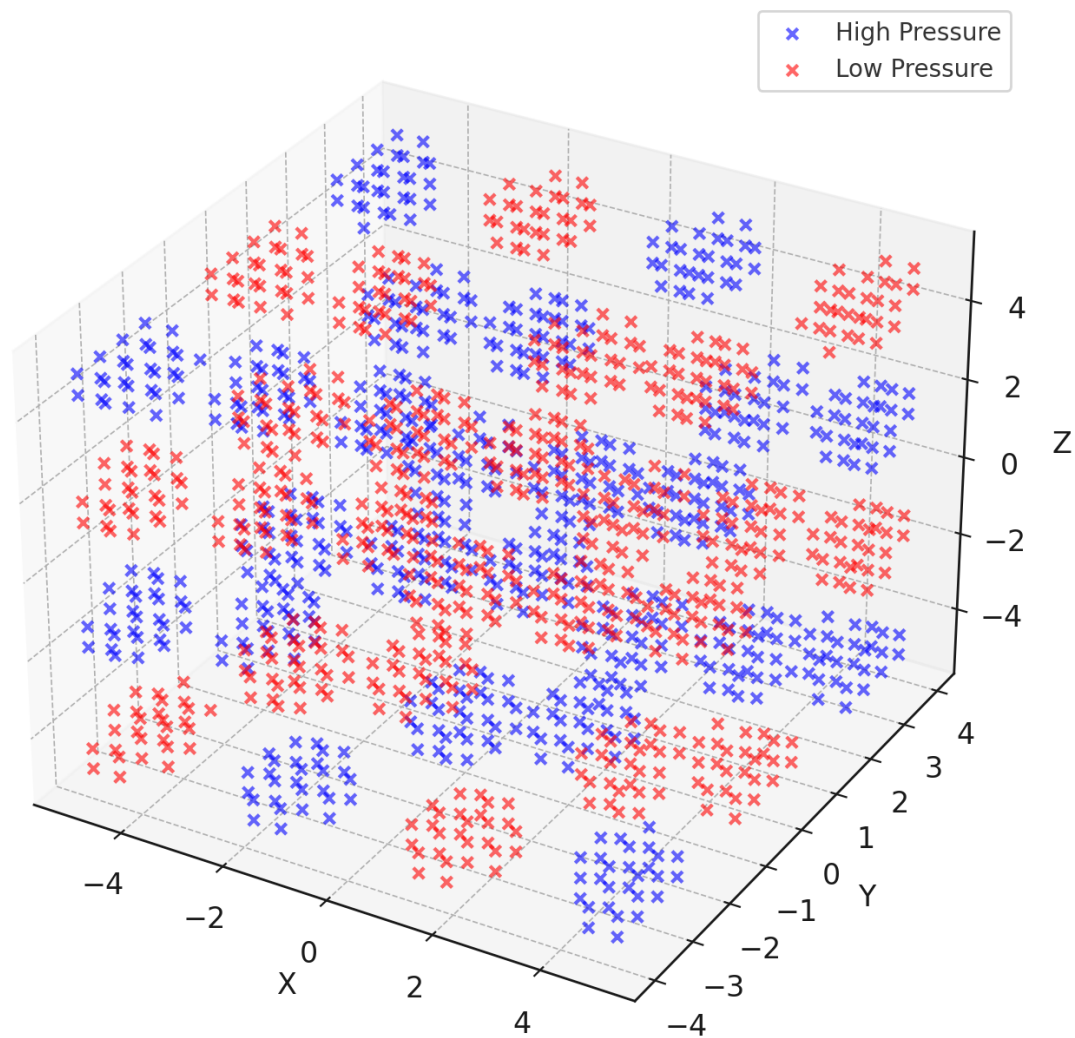
The Y-axis denotes the scale of evolutionary growth, which in this context refers to the spatial distribution and clustering of H1 atoms.

The Z-axis illustrates the stability of H1 systems, where each point could be a stable electron-proton arrangement, akin to hydrogen in its ground state or perhaps other 'stable' configurations like H4.

The colour map signifies the "stability" of each point in this 3D space, approximated by a cosine function for visualisation purposes. Darker colours indicate lower stability (or higher potential energy), and lighter colours signify higher stability (or lower potential energy).

This model thus captures an evolving universe at the atomic scale, where each point could be considered a stable or semi-stable "micro-environment" of H1, impacted by the forces of expansion and evolutionary growth.

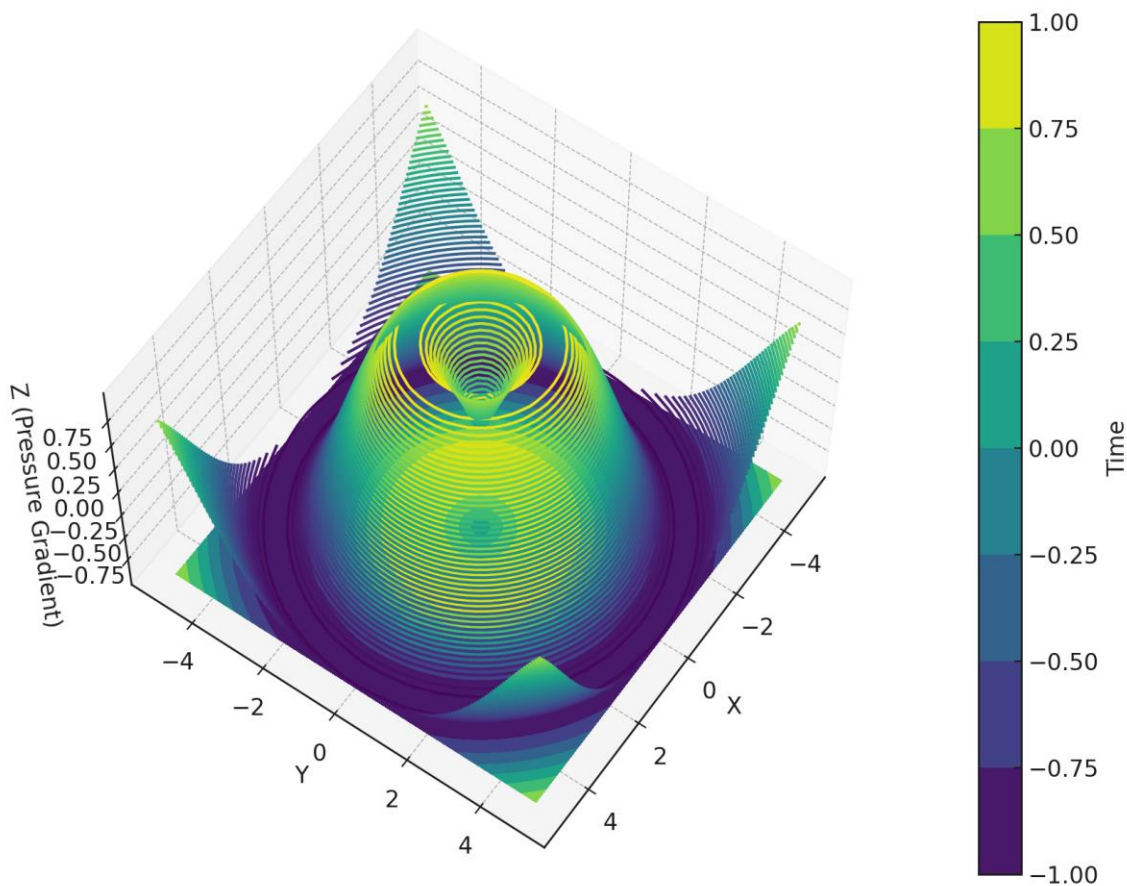
### 3D Contour Map with High and Low Pressure Gradients





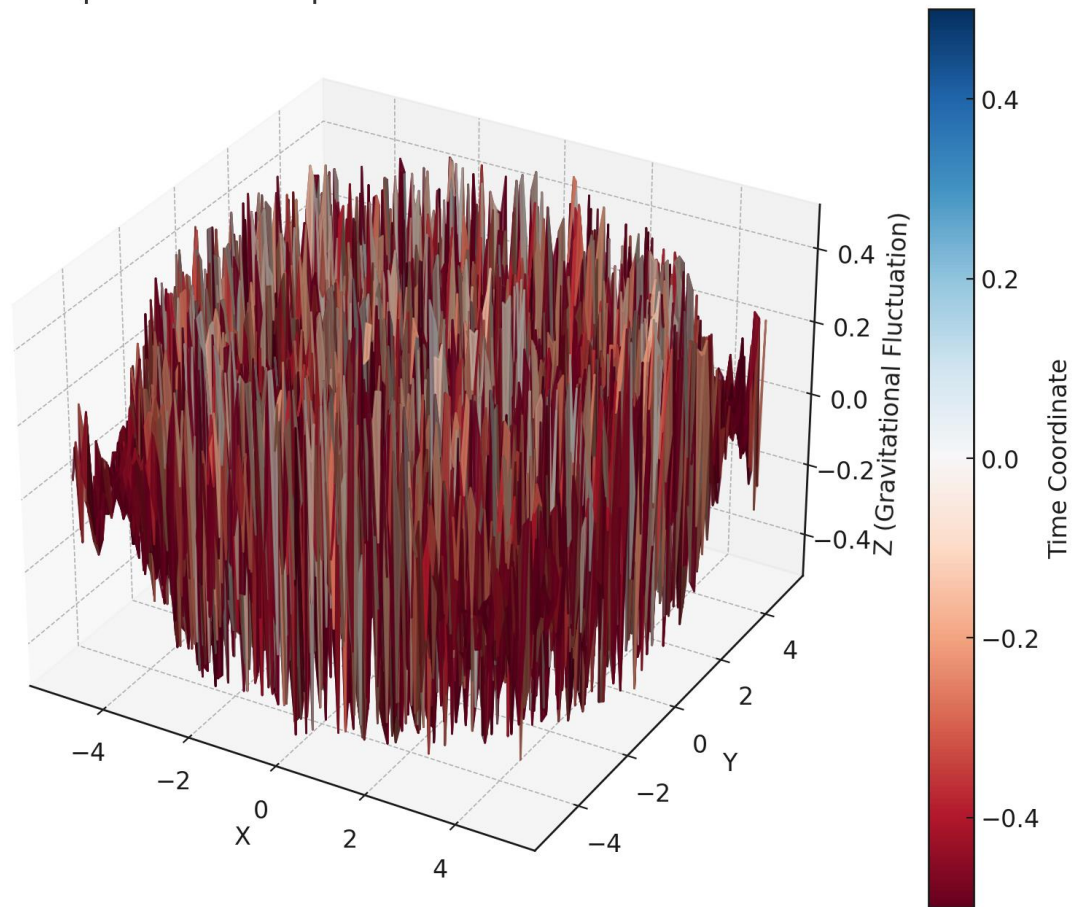
The above graphic serves as a three-dimensional contour map depicting a field of high and low pressure gradients. In this schematic, the blue and red points symbolise areas of high and low "pressure," respectively. The X, Y, and Z axes represent the spatial dimensions, while the colour gradient could serve as an analogue for time, ranging from past to future events in the system.

In this context, "pressure" could be a stand-in for any scalar field, such as gravitational potential or energy density. As you suggested, one might envision these high and low regions as analogous to "weather systems" in a spatial field influenced by time.



The image represents a 3D contour map, illustrating high and low-pressure gradients in a conceptual space-time framework. The X, Y, and Z axes symbolise spatial dimensions, while the colour gradient serves as a surrogate for the 'time coordinate'. The peaks and troughs are akin to gravitational fluctuations or 'weather systems' in this imagined model of existence.

## Landscape of Time-Dependent Gravitational Fluctuations



The graphic portrays a landscape of time-dependent gravitational fluctuations. The X, Y, and Z axes represent space, while the colour gradient signifies the time coordinate. The strongest time effects are centred around zero, with most variations in time strength ranging from -0.5 to +0.5.