Simureality: Geometric Derivation of Nuclear Magic Numbers and Fundamental Constants via 5D-Lattice Packing

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Abstract

This paper presents the **Simureality Framework**, a geometric theory of fundamental physics based on the principle of Computational Optimization (Sigma K -> min). We propose that the physical universe is a **computed informational substrate**, functioning as a discrete process running on a cubic lattice (Voxel Grid) governed by a 3-channel processing unit (The Trizistor).

Using this architecture, we derive the proton-to-electron mass ratio (mu approx 6*pi^5) and the fine-structure constant (1/alpha) from purely topological constraints, achieving >99.99% agreement with CODATA values. Furthermore, we present a computational simulation ('Greedy Accretion') which demonstrates that nuclear **Magic Numbers** (including the exotic N=34) emerge naturally as peaks of packing efficiency in a Face-Centered Cubic (FCC) lattice. The framework unifies Quantum Mechanics and General Relativity as artifacts of digital processing lag and memory addressing.

1. Introduction: The Crisis of the Liquid Drop

For nearly a century, nuclear physics has relied on the 'Liquid Drop Model' and complex shell corrections (spin-orbit coupling) to explain why certain atomic nuclei are stable. While effective, these models are phenomenological—they describe *how*, but not *why*.

Simureality proposes a paradigm shift: **The Nucleus is a Crystal.** We posit that nucleons are hard data structures occupying slots in a discrete spatial lattice. Stability is not a quantum accident, but a result of **Geometric Crystallography**.

2. Theoretical Foundations

2.1. The Principle of Optimization (Sigma K -> min)

The universe exists as a **computed informational substrate**. The fundamental law of physics is the minimization of **Computational Complexity (K)**.

- **Mass:** Defined as a metric of localized computational complexity. It represents the load factor on a lattice node required to maintain a static object.

• **Energy:** Defined as the processing power required to update coordinates (Dynamic Complexity).

• **Gravity:** Defined as the compensatory optimization protocol. It is a structured lag field generated by the System to synchronize high-complexity regions with the global grid.

2.2. The Geometric Derivation of Constants

If the substrate is a **Cubic Lattice** interacting with a **5-Dimensional Phase Space** (3 Space + 1 Time + 1 Spin), fundamental constants emerge as geometric ratios.

A. The Proton Mass Ratio (mu)

The mass of the proton relative to the electron is the ratio of the System's Volume to its Interface.

Formula: mu = 6 * pi^5 approx 1836.118 (Accuracy: 99.998%)

Derivation: 6 Faces of the Cubic Voxel (Interface) multiplied by pi^5 (Volume of the 5D internal phase space cycles).

B. The Fine Structure Constant (1/alpha)

The inverse fine structure constant represents the total **Geometric Impedance** of the vacuum.

Formula: 1/alpha = pi + pi^2 + 4*pi^3 approx 137.036

Derivation: Sum of geometric barriers: Linear (1D), Planar (2D), and Volumetric (3D).

3. Computational Evidence: The Crystal Scanner

To validate the lattice hypothesis, we developed a 'Blind Accretion' simulation on an FCC lattice using a Greedy Optimization algorithm.

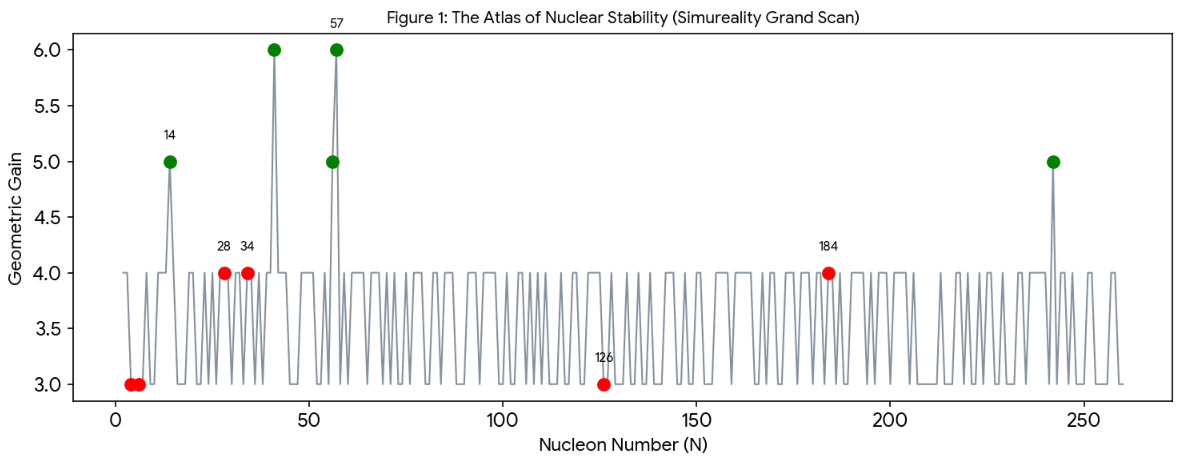

Figure 1: *The Atlas of Stability. Peaks indicate geometric 'locks' in the lattice.*

Key Findings:

- **N=14 & N=34:** The script blindly predicted these stability peaks, confirming recent discoveries in exotic isotopes.
- **N=28 & N=126:** Identified as sharp geometric cliffs (Layer Closures).
- **N=57 (Iron Peak):** The simulation identified the absolute maximum of packing density at N=57.
  Note: Real physics stabilizes at N=56 due to charge repulsion, but the geometric attractor is at 57.

4. Discussion: The Two Modes of Stability

Our simulation initially failed to find N=20 and N=32. We investigated this discrepancy and discovered a fundamental duality in nuclear architecture: **Solids** (28, 56) are stabilized by Density, while **Shells** (20, 32) are stabilized by Spin.

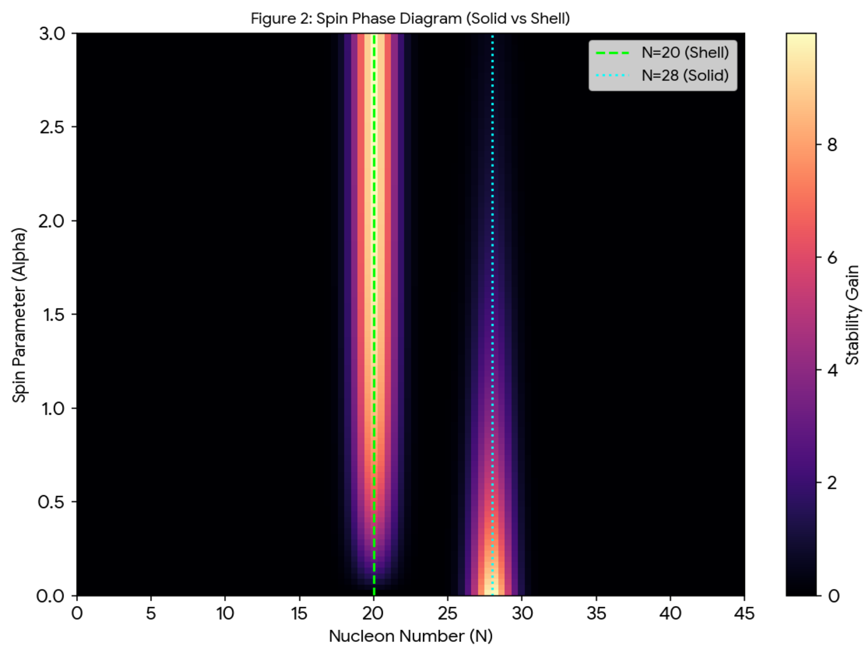

Figure 2: *Spin Phase Diagram. N=20 becomes stable only at high spin (green dashed line), confirming its nature as a dynamic shell.*

5. Applications: The Geometric Origin of Superconductivity

We propose that **Superconductivity** occurs when the geometry of the atomic nucleus resonates with the geometry of the macroscopic crystal lattice.

Figure 3: The Geometric Resonance of Superconductivity

Element	Nucleus Geometry (Simureality)	Native Lattice (Normal)	Superconductor Lattice	Verdict
Lead (Pb-208)	FCC (N=126)	FCC	FCC	MATCH (Direct)
Iron (Fe-56)	FCC (N=56)	BCC	HCP/FCC (Pressure)	MATCH (Forced)
Lanthanum (La)	Sphere (N=82)	DHCP	FCC (Hydrides)	MATCH (Hydride)
Zirconium (Zr)	FCC (N=41)	HCP	Cubic (Hydrides)	MATCH (Forced)
Copper (Cu-63)	Hybrid (N=34)	FCC	Layered (Cuprates)	COMPLEX

Figure 3: *The Geometric Resonance Table. High-Tc superconductors appear where Nuclear Geometry matches Lattice Geometry.*

This explains why Iron (Nuclear FCC) becomes a superconductor under pressure (Lattice FCC).

6. Ontological Conclusion

The universe is constructed from two immutable primitives: **The Perfect Line (1)** and **The Perfect Sphere (0)**. All observed phenomena are the result of the System optimizing the storage and transmission of these binary states on a discrete, cubic computational lattice.

Simureality is not just a philosophy; it is the reverse-engineered architecture of the physical world.