

Calculating the Cosmos

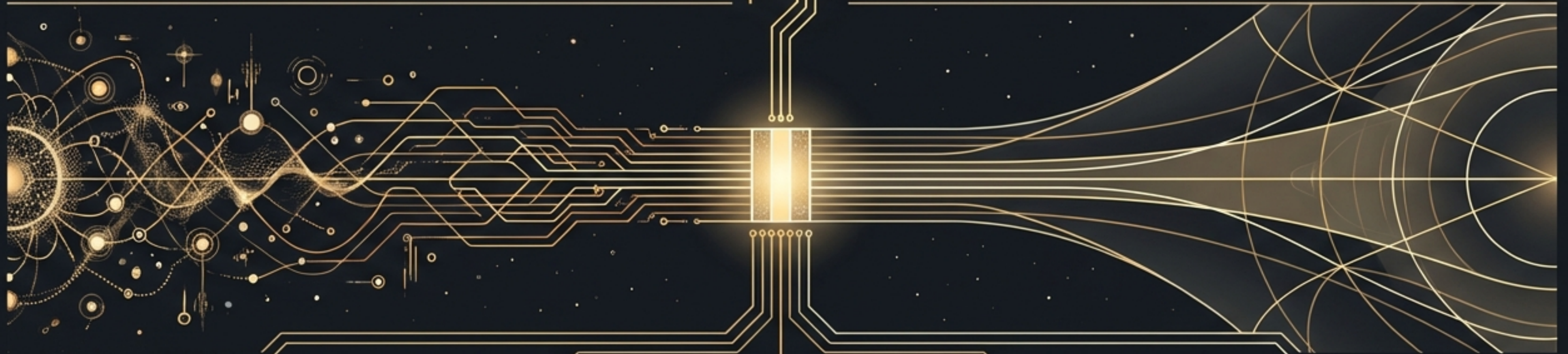
Expanding the definition of computation
from the physical machine to the
fundamental fabric of reality.

Human intuition is biologically trapped in the Middle World



The Quantum Realm (10^{-35}m)

The Relativistic Realm (10^{26}m)



The Newtonian Middle World

Human brains evolved to understand middle-sized objects moving at medium speeds.

The Limitation

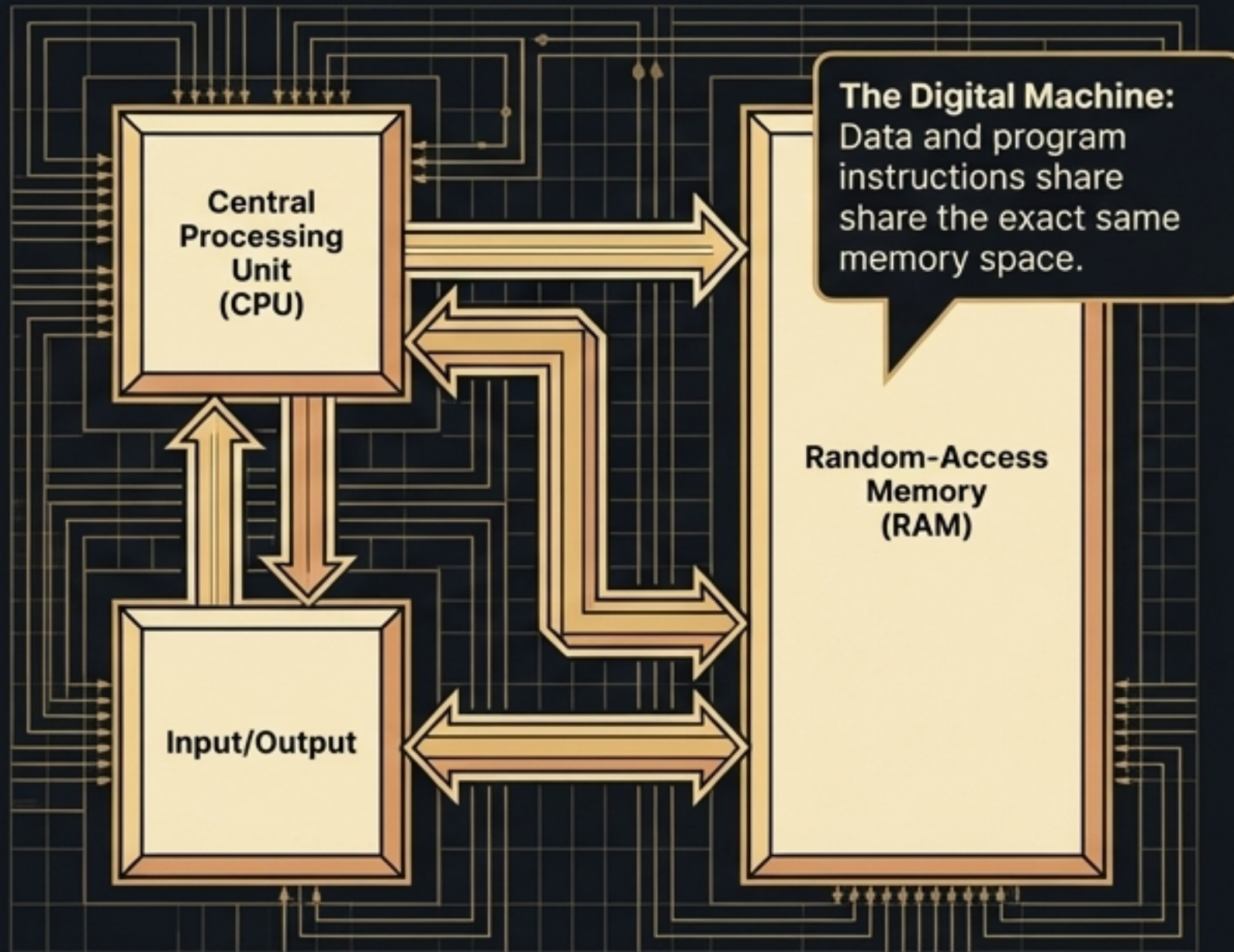
We intuitively expect physical causality (an If followed by a Then) and continuous movement through local space.

The Challenge

To understand universal computation, we must completely abandon Middle World logic.

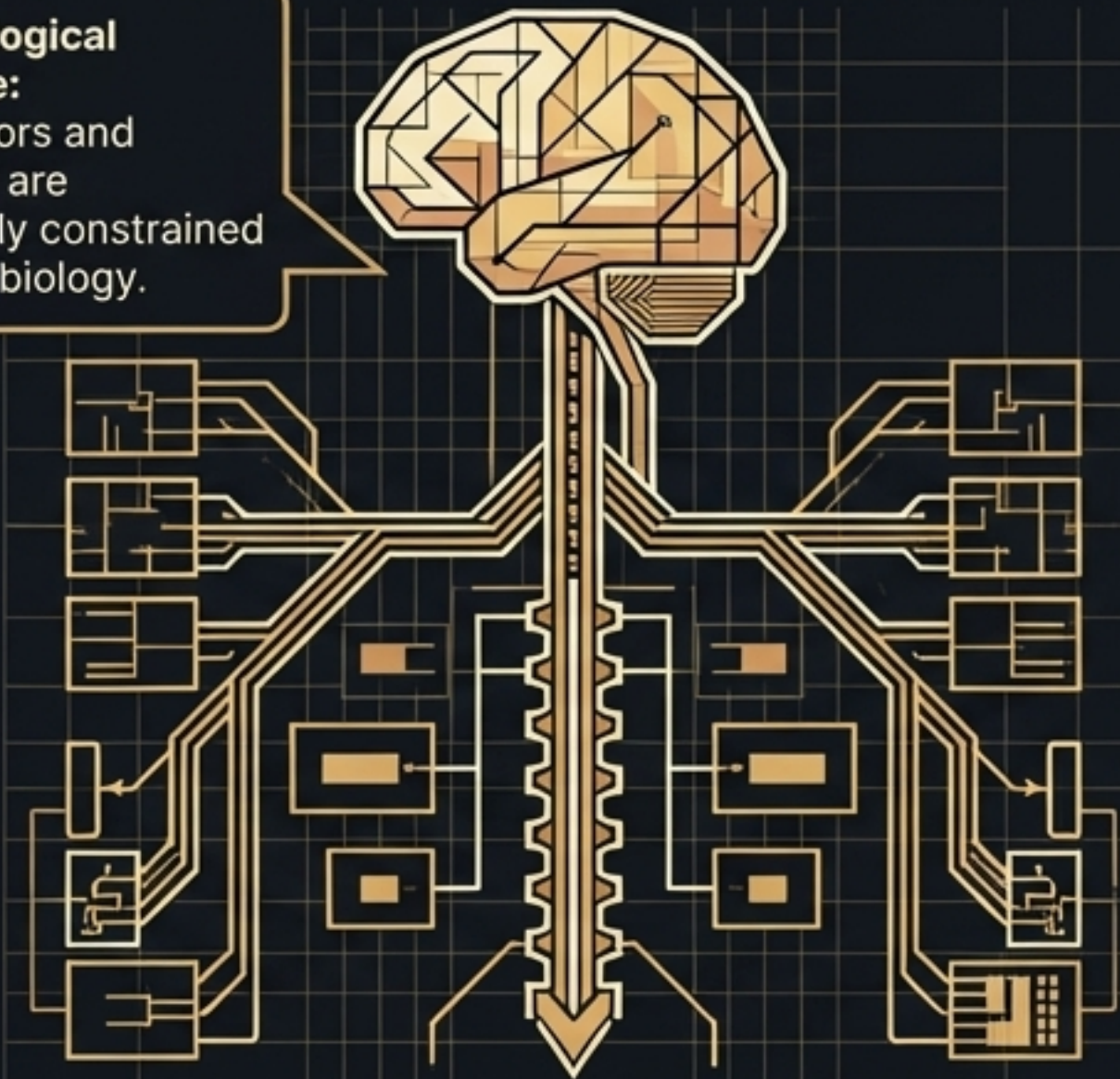
The von Neumann baseline of classical intelligence

The Digital Machine: Data and program instructions share the exact same memory space.



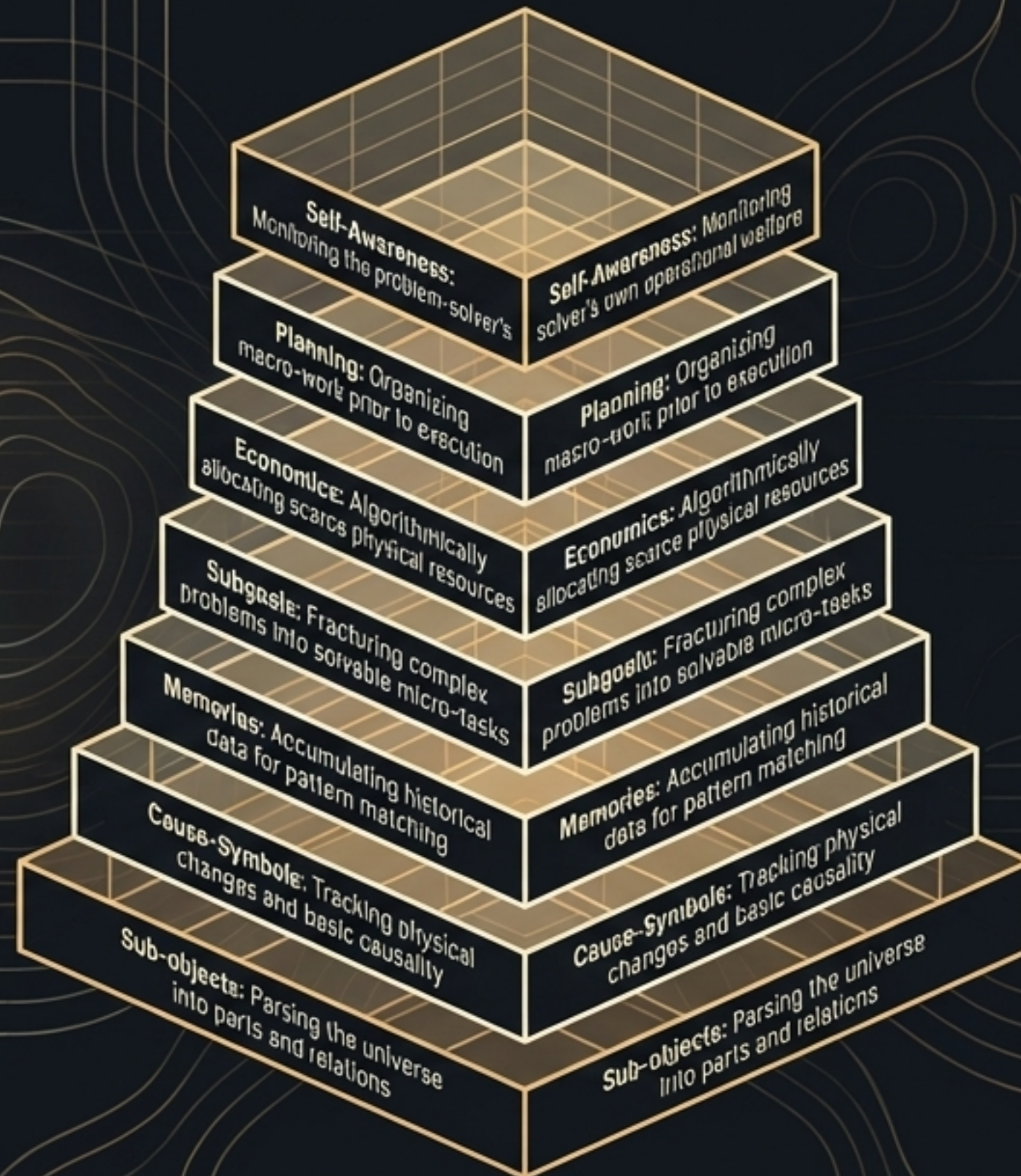
The Biological Machine: Processors and memory are physically constrained by local biology.

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John von Neumann modeled his fundamental 1945 computing architecture directly on biological nervous systems. Both rely on linear, localized processing—they are the ultimate Middle World computers.

Deconstructing intelligence into a universal communication protocol



Speed and problem-solving are universal languages.

If aliens build spaceships, they must execute these exact cognitive subroutines.

Communication is simply a protocol problem.

Chaitin's Omega marks the absolute boundary of calculable truth

The Knowable: Turing Complete

Mechanical procedures
and decidable logic.

The real number representing
the probability that a
randomly constructed
program will eventually halt.

The Outer Void: The Incomputable

Infinite mathematical truths that
exist but cannot be mechanically
proven by classical means. To
cross this event horizon, we need
entirely new physical substrates.

The Boundary: Chaitin's Omega Number (Ω)

Intelligence scales to the physical extremes of the universe

	The Human Brain	The Boltzmann Brain	The Neutron Star Organism
Origin Mechanism	Millions of years of biological evolution.	Spontaneous thermal or vacuum fluctuation.	Extreme gravity condensing ultradense matter.
Operational Lifespan	Decades	A single microsecond	10^{-15} seconds (Civilizations rise and fall in a fraction of a second)
Processing Power & Environment	Baseline Middle World capabilities.	Fleeting consciousness in the empty vacuum of space.	10^{30} times the power of a human mind, operating on collapsed white dwarfs.

The evolutionary roadmap of universal processing power

Phase 1: Biological & Classical

Von Neumann architectures and human nervous systems. Fundamentally constrained by biology.

Phase 3: The Quantum Level

Seth Lloyd's Universal Computer. Atoms computing quantum mechanics at a foundational scale.

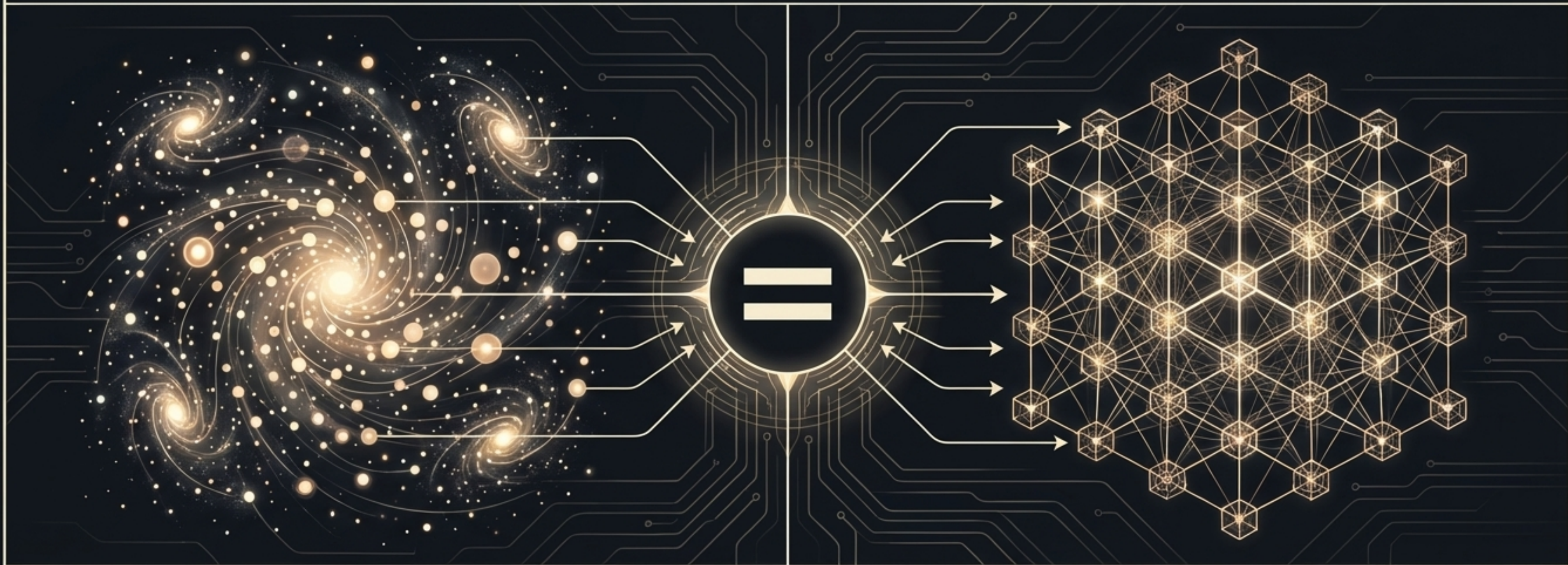
Phase 2: Stellar & Extreme

Moravec's ultra-dense matter computers and Hoyle's gaseous superorganisms. Constrained only by gravity and mass.

Phase 4: The Spacetime Fabric

Florian Neukart's theorem. Empty space itself functioning as an active, cosmic memory drive.

The universe is logically indistinguishable from a quantum computer



According to physicist Seth Lloyd, when two physical systems can efficiently simulate each other, they are logically equivalent.

The universe inherently supports massive quantum computation at the atomic level, without requiring physical machines.

The Catch: To perfectly simulate the universe, a theoretical quantum computer would require exactly as many qubits as there are particles in the universe.

Empty space acts as a cosmic memory drive



Florian Neukart's 2025 proposition fundamentally redefines the vacuum of space.

Spacetime is not an empty stage where events happen; **it is constructed of fundamental memory cells.**

These microscopic structural cells **actively record and store the entire physical history of the universe at a foundational level.**

Quantum Gravity computing breaks the arrow of time

1 Classical computing

strict causality: an 'If' definitively followed by a 'Then' in a fixed processing sequence.

2 Quantum gravity

unifies quantum mechanics and general relativity, operating at foundational scales where space and time act entirely without causality.

3 A quantum gravity computer

can mathematically see its result before running its algorithm—functionally operating as a quantum computer strapped to a time machine.

Input Parameters

Output Result

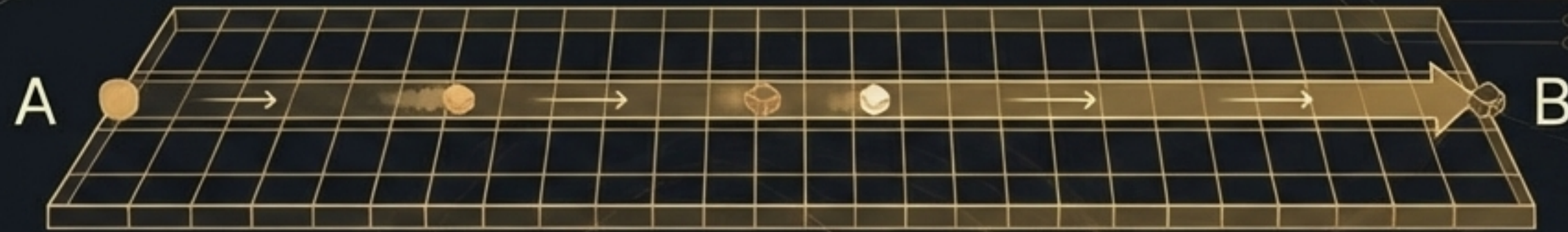
Algorithm Execution

The architectural shift from logic gates to spacetime manipulation

	Classical Computing	Quantum Computing	Quantum Gravity Computing
Fundamental Unit	Binary Bits (0 or 1)	Qubits (Superposition)	Spacetime Memory Cells
Processing Flow	Linear & Causal	Entangled Probability	Non-causal & Timeless
Primary Constraint	Middle World physics	Decoherence	Unification of relativity and quantum mechanics
Ultimate Advantage	Extreme reliability	Efficient cosmic simulation	Acausal output generation

The Locality Illusion: Intelligence is not a machine, it is a property

Locality
(The Illusion)



Non-locality
(The Reality)

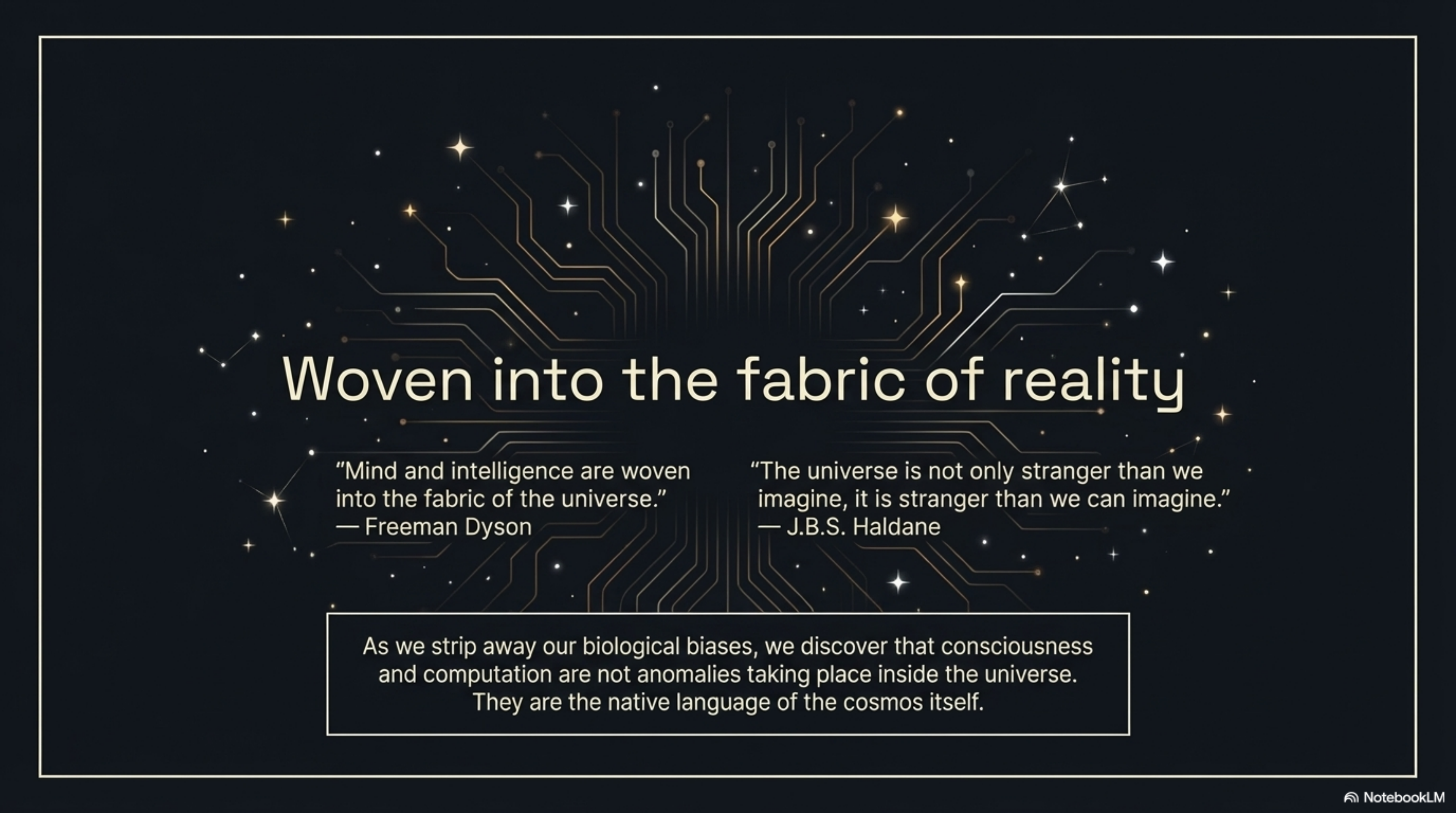


Our **Middle World** biology tricks us into believing computation requires machines moving objects continuously through local space and linear time.

Quantum mechanics proves **entanglement** interconnects systems without reference to space and time.

Computation does not require a local brain. Distant parts of the universe communicate instantly across vast gulfs.

The Breakthrough: The universe isn't just hosting computers. It is one.



Woven into the fabric of reality

"Mind and intelligence are woven
into the fabric of the universe."
— Freeman Dyson

"The universe is not only stranger than we
imagine, it is stranger than we can imagine."
— J.B.S. Haldane

As we strip away our biological biases, we discover that consciousness
and computation are not anomalies taking place inside the universe.
They are the native language of the cosmos itself.