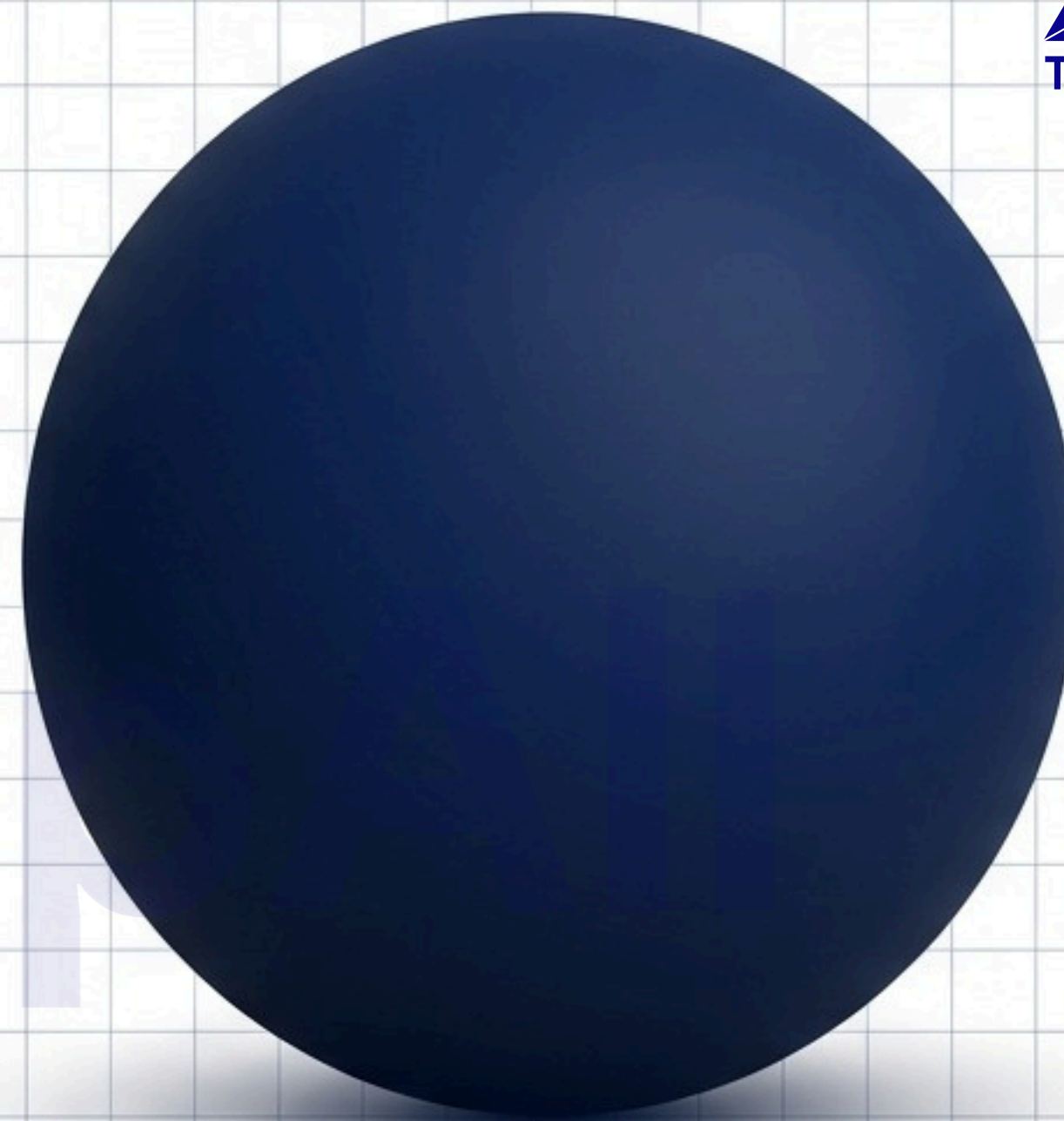


Dalton's Atomic Theory

The Foundation of Modern Chemical Philosophy



Democritus — Philosophy

“a-tomio” (indivisible)

John Dalton — Science

Publishes “A New System of Chemical Philosophy”

460 BC

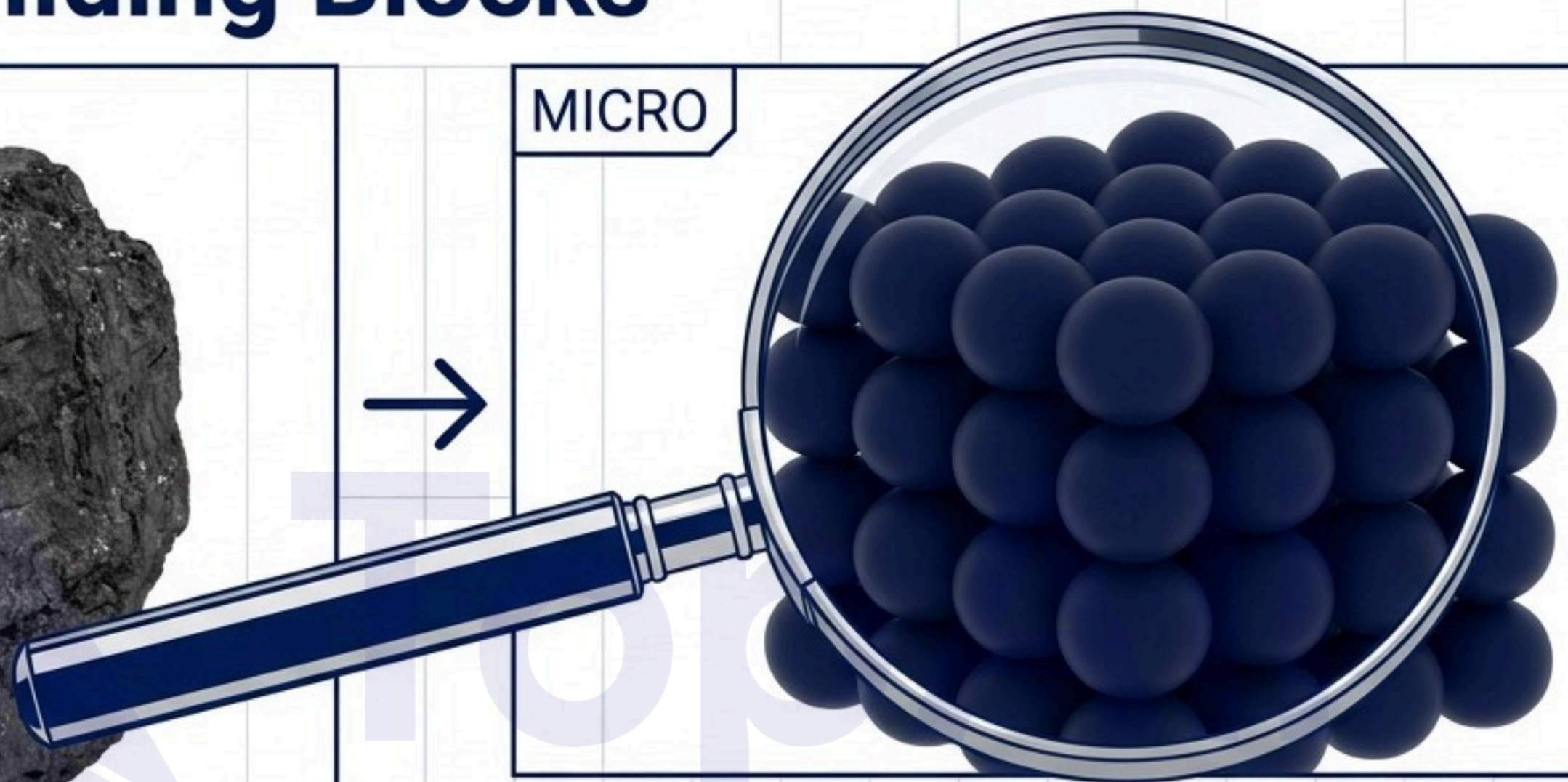
1808

The Ultimate Building Blocks

MACRO



MICRO



Matter is not continuous. If you keep dividing matter, you eventually reach a fundamental, uncuttable limit.

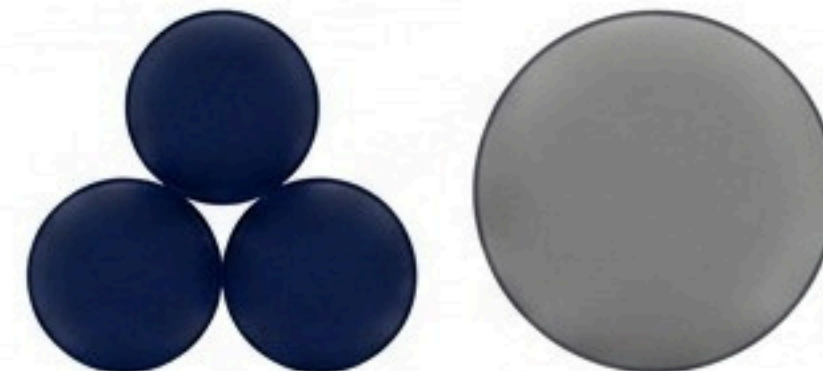
Dalton transitioned the idea of the **atom** from philosophical speculation to a **scientific model** capable of explaining experimental **laws of chemical combination**.

The Four Postulates of Dalton's Theory



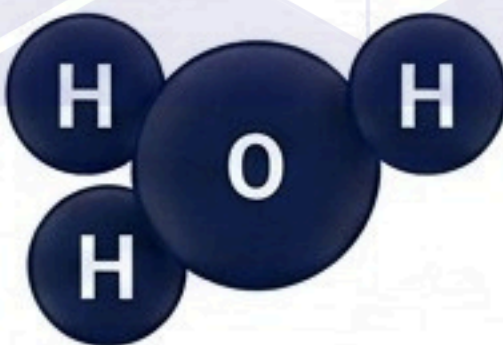
Indivisible.

Matter consists of indivisible atoms.



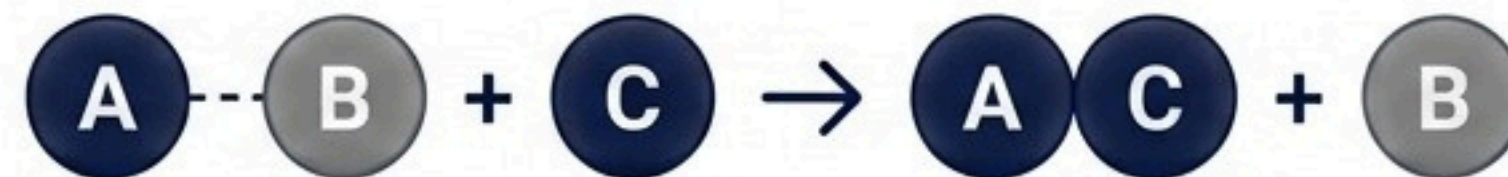
Identical.

Atoms of a given element are identical in mass and properties. Atoms of different elements differ in mass.



Fixed Ratios.

Compounds form when atoms of different elements combine in fixed, whole-number ratios.



Reorganization.

Chemical reactions involve the reorganization of atoms. Atoms are neither created nor destroyed.



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$$E=mc^2$$



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Dalton's Rule Bank



RULE 01: $\text{ATOM_COUNT}(\text{REACTANTS}) = \text{ATOM_COUNT}(\text{PRODUCTS})$

RULE 02: $\text{MASS}(\text{ATOM_X}) = \text{CONSTANT}$

RULE 03: $\text{COMPOUND_RATIO}(\text{A:B}) = \text{FIXED_INTEGER_RATIO}$

RULE 04: $\text{ATOM_CREATION} = \text{FALSE} ; \text{ATOM_DESTRUCTION} = \text{FALSE}$

These mathematical rules govern all classical stoichiometric calculations.



Reorganization, NOT Creation.

The Myth: Examiners will try to trick you by describing reactions where the product has entirely different properties than the reactants (e.g., highly flammable H_2 + combustion supporter $\text{O}_2 \rightarrow$ fire extinguisher H_2O).

The Reality: Do not confuse macroscopic property changes with microscopic atom creation. The atoms are exactly the same; only their **arrangement** has changed. You can **never** balance an equation by adding a new type of atom.



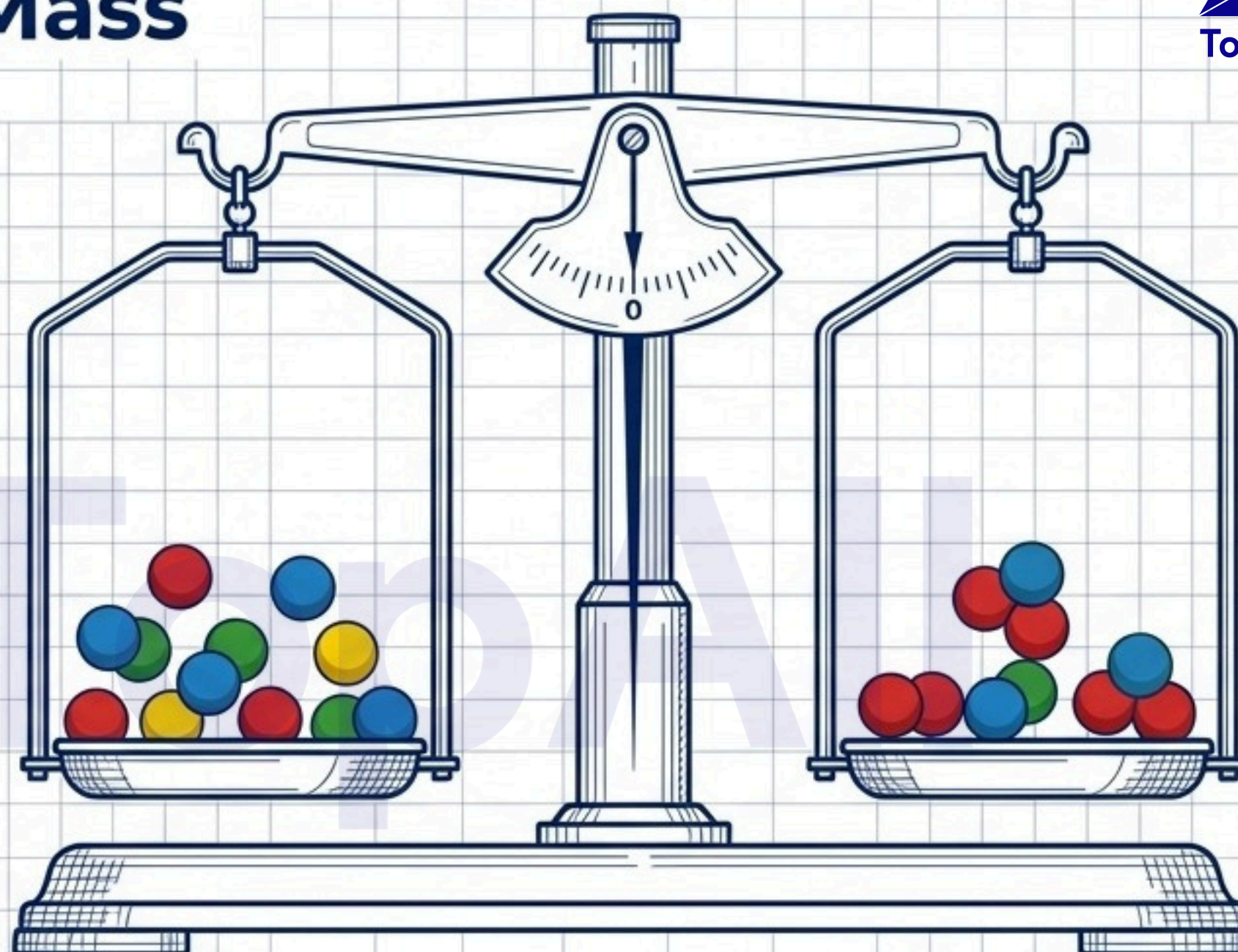
Proving Conservation of Mass

Dalton's Postulate 4: Atoms are neither created nor destroyed in a chemical reaction. They only reorganize.

-> Therefore: Total number of each type of atom before reaction = Total number after reaction.

Dalton's Postulate 2: Each individual atom has a fixed, identical mass.

**If the number of atoms remains constant, and the mass of each atom remains constant, the Total Mass must remain constant.
(Law of Conservation of Mass proven).**



The Legacy of Dalton's Theory

What Dalton Explained

- ✓ Provided a microscopic model for macroscopic matter.
- ✓ Explained the Law of Conservation of Mass.
- ✓ Explained the Law of Definite Proportions.
- ✓ Explained the Law of Multiple Proportions.

What Dalton Failed to Explain

- ✗ Could not explain Gay Lussac's Law of Gaseous Volumes.
- ✗ Could not explain why or how atoms combine (valency and chemical bonding forces were completely unknown at the time).



You've Learned the Theory.

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