



PHYSICS FOR PHYSICS TEACHER 1

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Nature and Development of Physics

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NATURE AND THE DEVELOPMENT OF PHYSICS

DECODING THE HIDDEN MECHANISMS
OF THE UNIVERSE

Physics is the study of matter, energy, and the fundamental forces of nature. It is the process of turning observation into prediction.

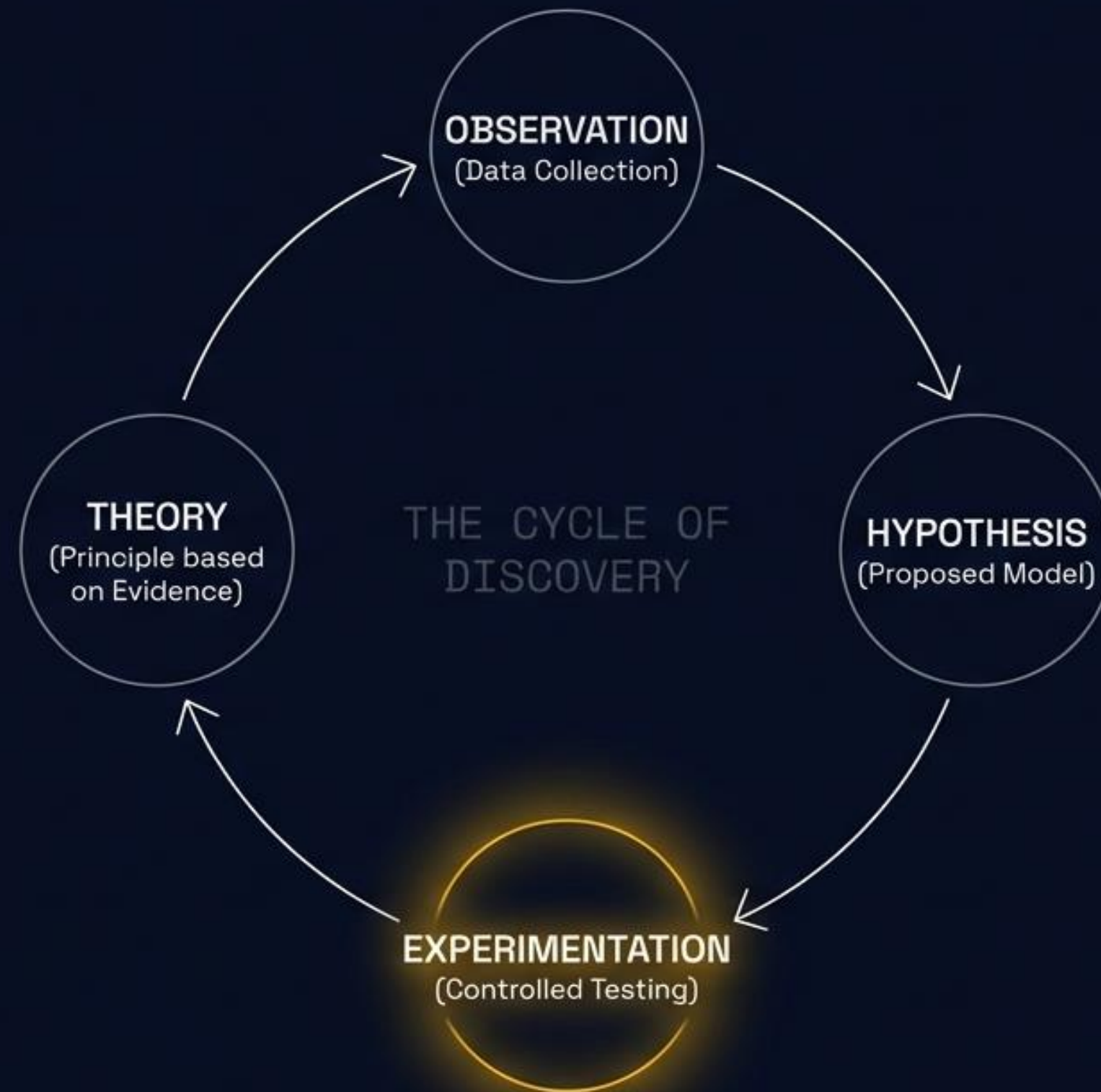


THE CHALLENGE OF THE CLOSED BOX



Physics is the art of creating models
to explain the invisible.

- 1. OBSERVE:**
Shake, weigh,
tilt.
- 2. MODEL:**
Imagine the
unseen contents.
- 3. TEST:**
Compare model
vs. reality.



Note: Theories are dynamic. New data demands new models.

A UNIVERSAL LANGUAGE: SI UNITS



LENGTH:
Meter (m)



MASS:
Kilogram
(kg)



TIME:
Second (s)



CURRENT:
Ampere (A)



TEMP:
Kelvin (K)



SUBSTANCE:
Mole (mol)



INTENSITY:
Candela (cd)

All other units (Newton, Joule, Pascal)
are derived from these seven foundations.

SCALING THE UNIVERSE



Giga (G) = 10^9

Mega (M) = 10^6

Kilo (k) = 10^3

Milli (m) = 10^{-3}

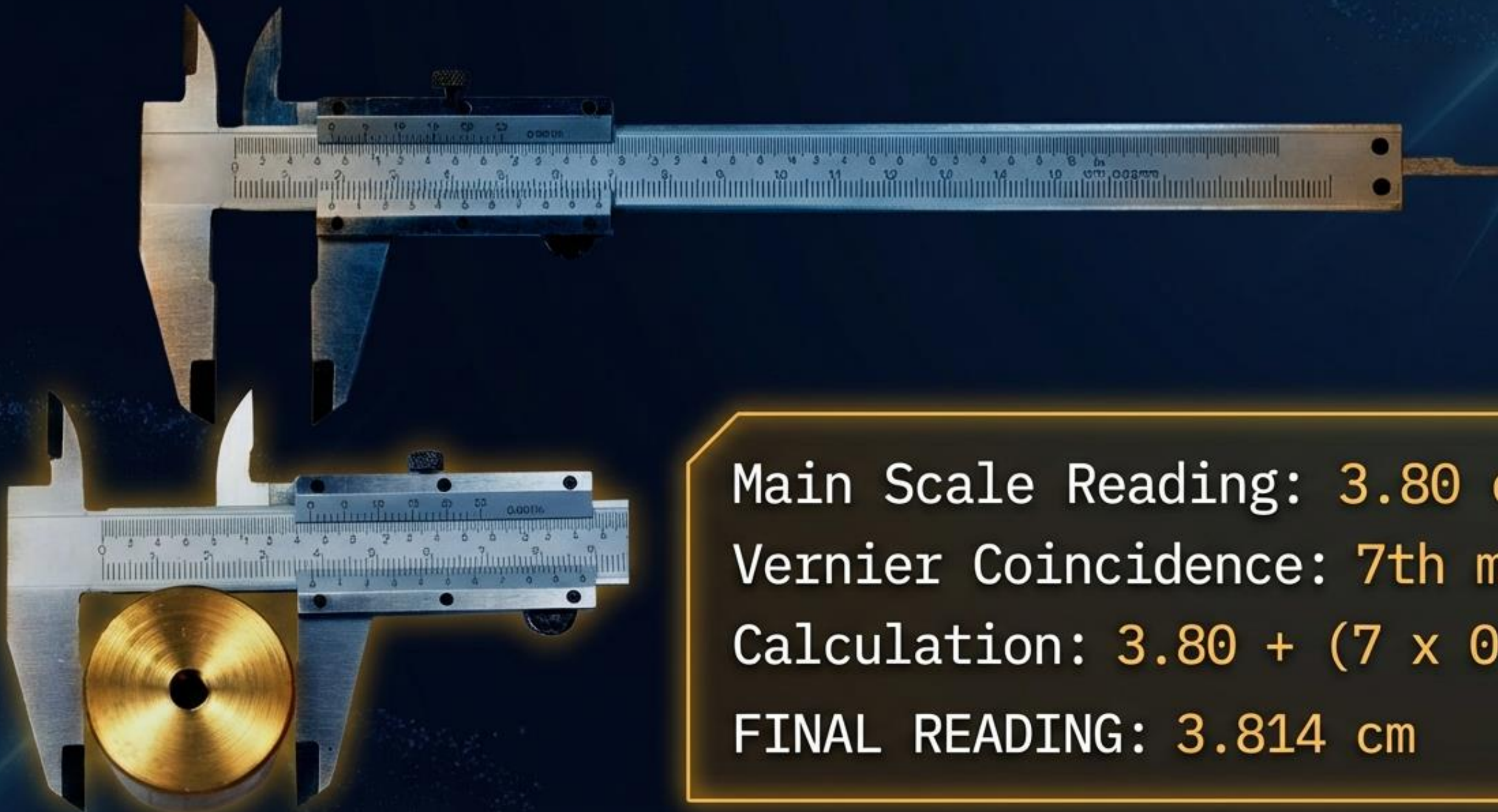
Micro (μ) = 10^{-6}

Nano (n) = 10^{-9}

The Problem: Nature exists at extremes.

The Solution:
Scientific Notation
($A \times 10^n$).

EXTENDING THE SENSES: PRECISION TOOLS



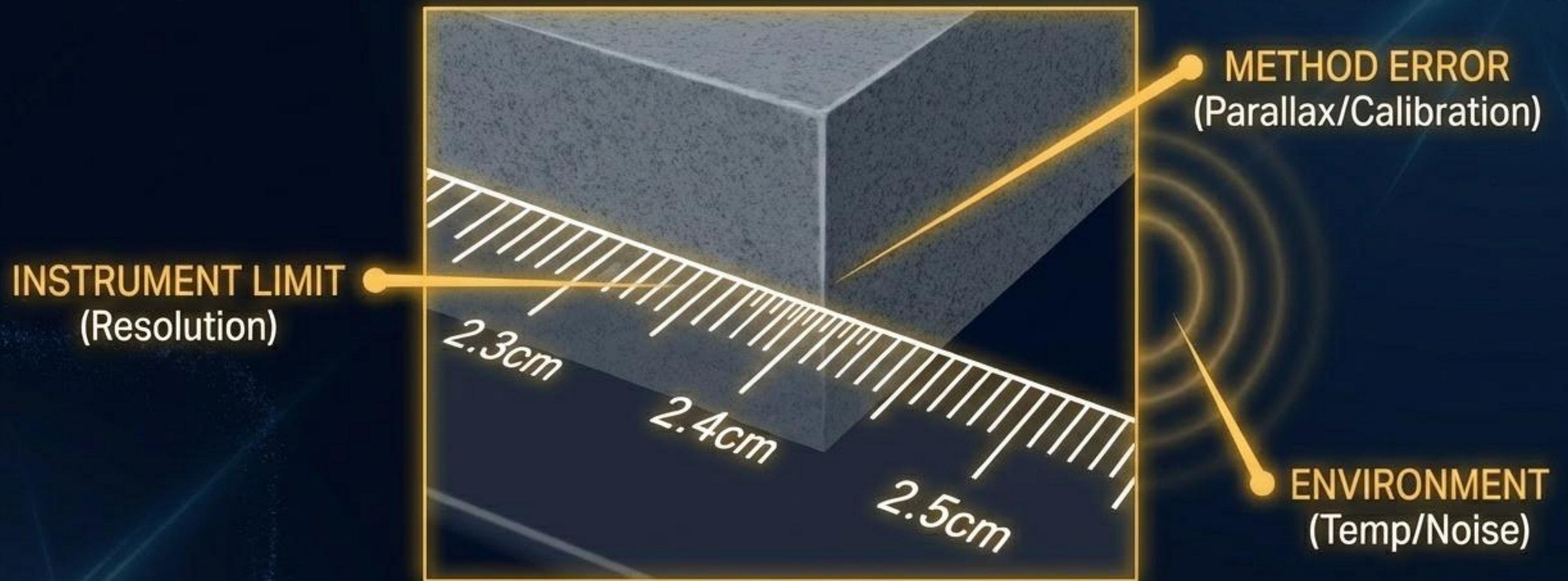
Main Scale Reading: 3.80 cm

Vernier Coincidence: 7th mark

Calculation: $3.80 + (7 \times 0.002)$

FINAL READING: 3.814 cm

THE LIMIT OF KNOWLEDGE: UNCERTAINTY



Truth is a range. Report as: 2.50 ± 0.05 cm

HITTING THE TARGET: ACCURACY VS. PRECISION



Low Accuracy,
Low Precision



Low Accuracy,
High Precision



High Accuracy,
High Precision

Accuracy is correctness. Precision is consistency.

SIGNIFICANT FIGURES: CALCULATED HONESTY

4.5 cm

4.500 cm

These zeros declare
precision to the
thousandth place.

- Non-zero digits count.
- Zeros between numbers count.
- Trailing zeros after a decimal count.



THE WEAKEST LINK RULE

$$\text{Mass (m)} = 26.19 \text{ g} \quad 4 \text{ Sig Figs}$$

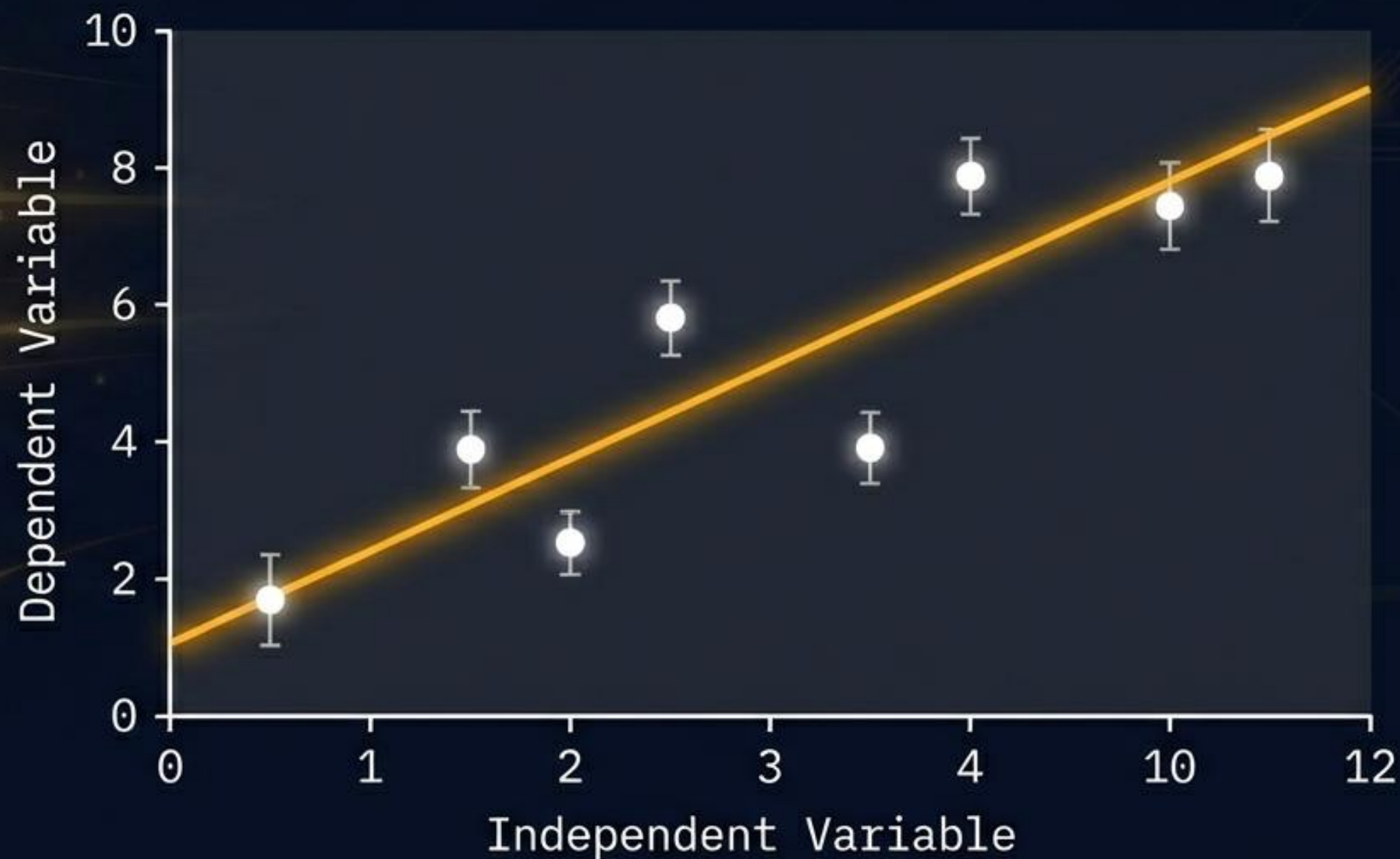
$$\text{Volume (V)} = 8.9 \text{ cm}^3 \quad 2 \text{ Sig Figs} - \text{The Weakest Link}$$

$$\text{Density (D)} = \frac{m}{V} = \frac{26.19}{8.9} = 2.94269\dots$$

CORRECT ANSWER: 2.9 g/cm³

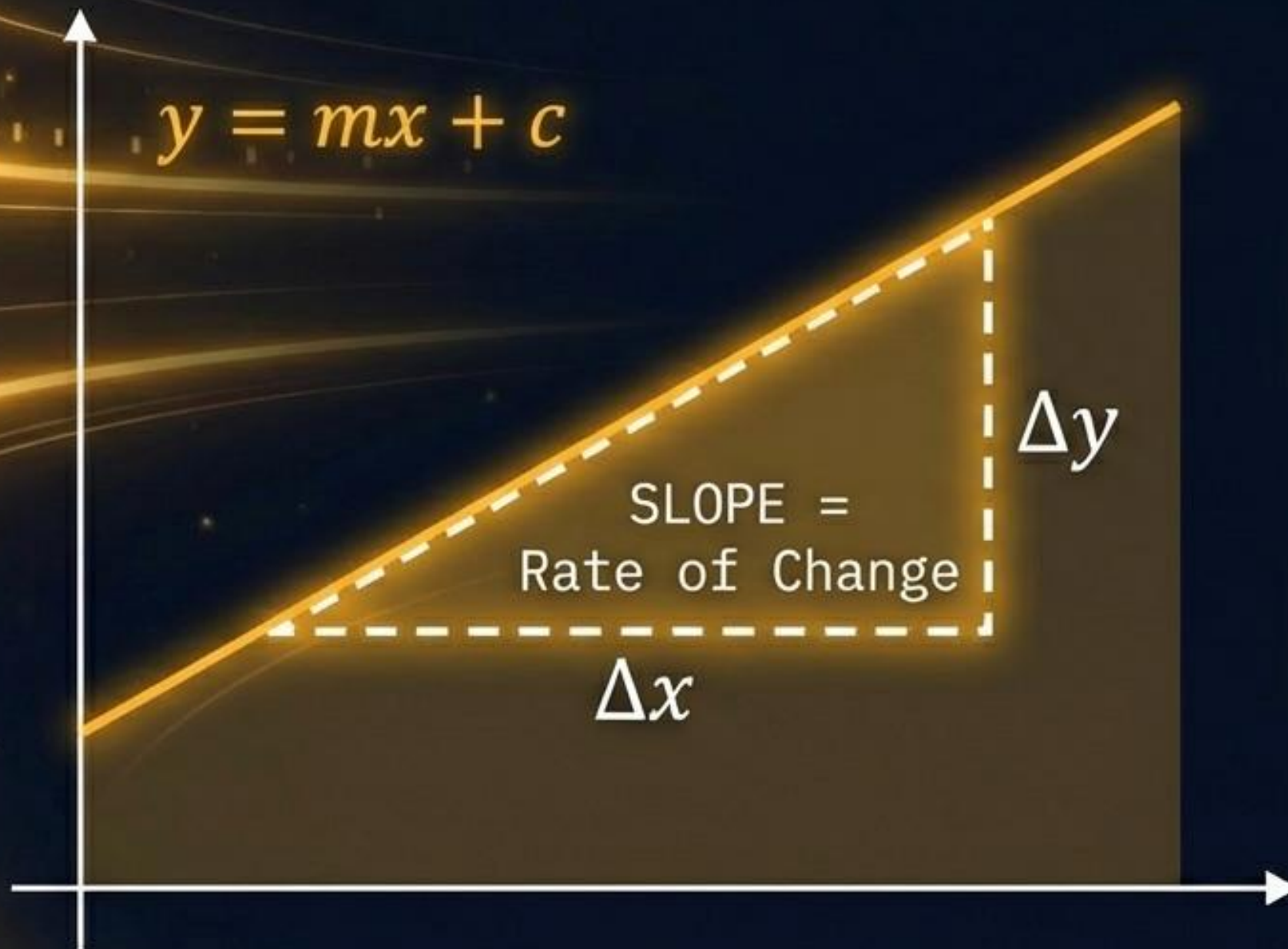
Result cannot be more precise than the roughest measurement.

VISUALIZING TRUTH: THE POWER OF GRAPHS



We do not connect the dots. We draw the trend to average out the error.

DECODING THE LINE

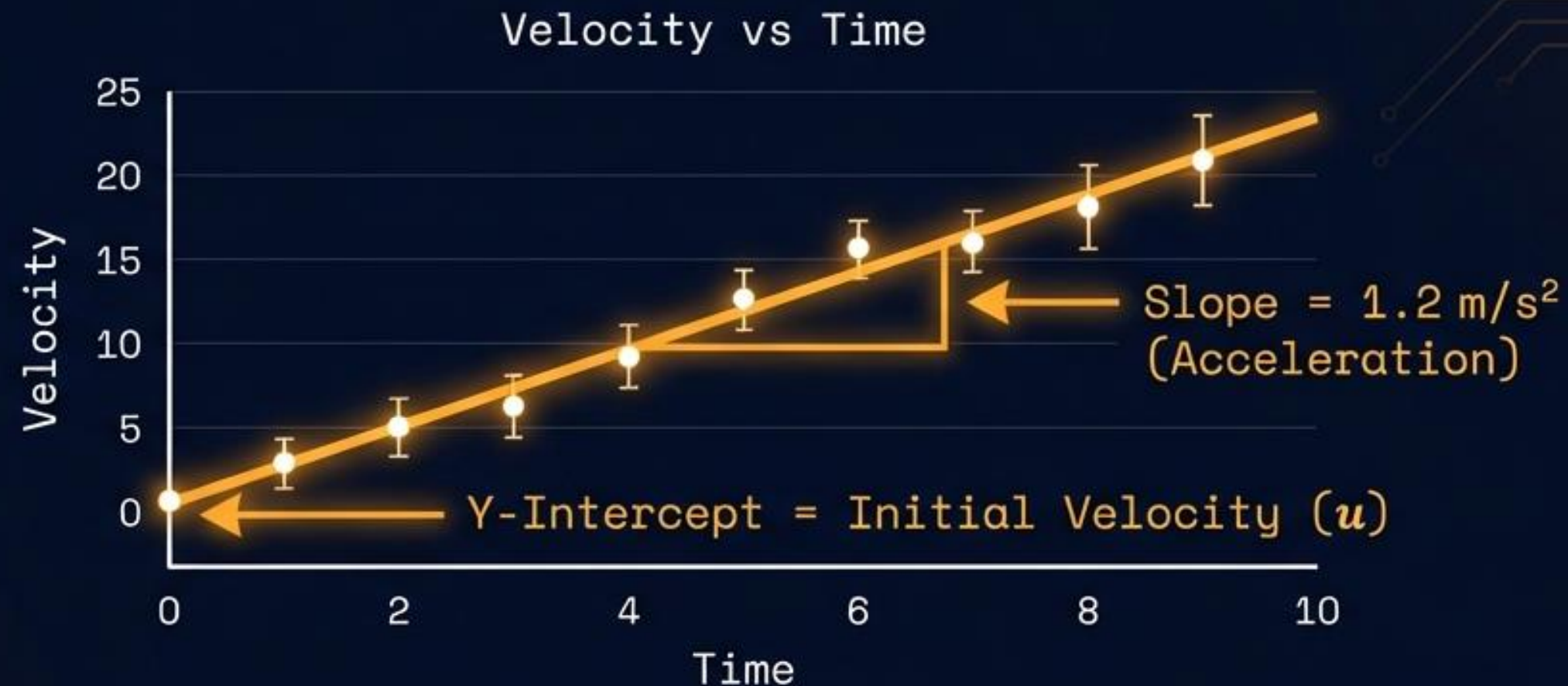


Velocity vs. Time Graph
→ Slope = ACCELERATION

Force vs. Extension Graph
→ Slope = SPRING CONSTANT (k)

AREA UNDER CURVE = Accumulation (e.g., Work Done)

CASE STUDY: MOTION ANALYSIS



$$v = u + at$$

We found the object's physics just by looking at the geometry of the line.

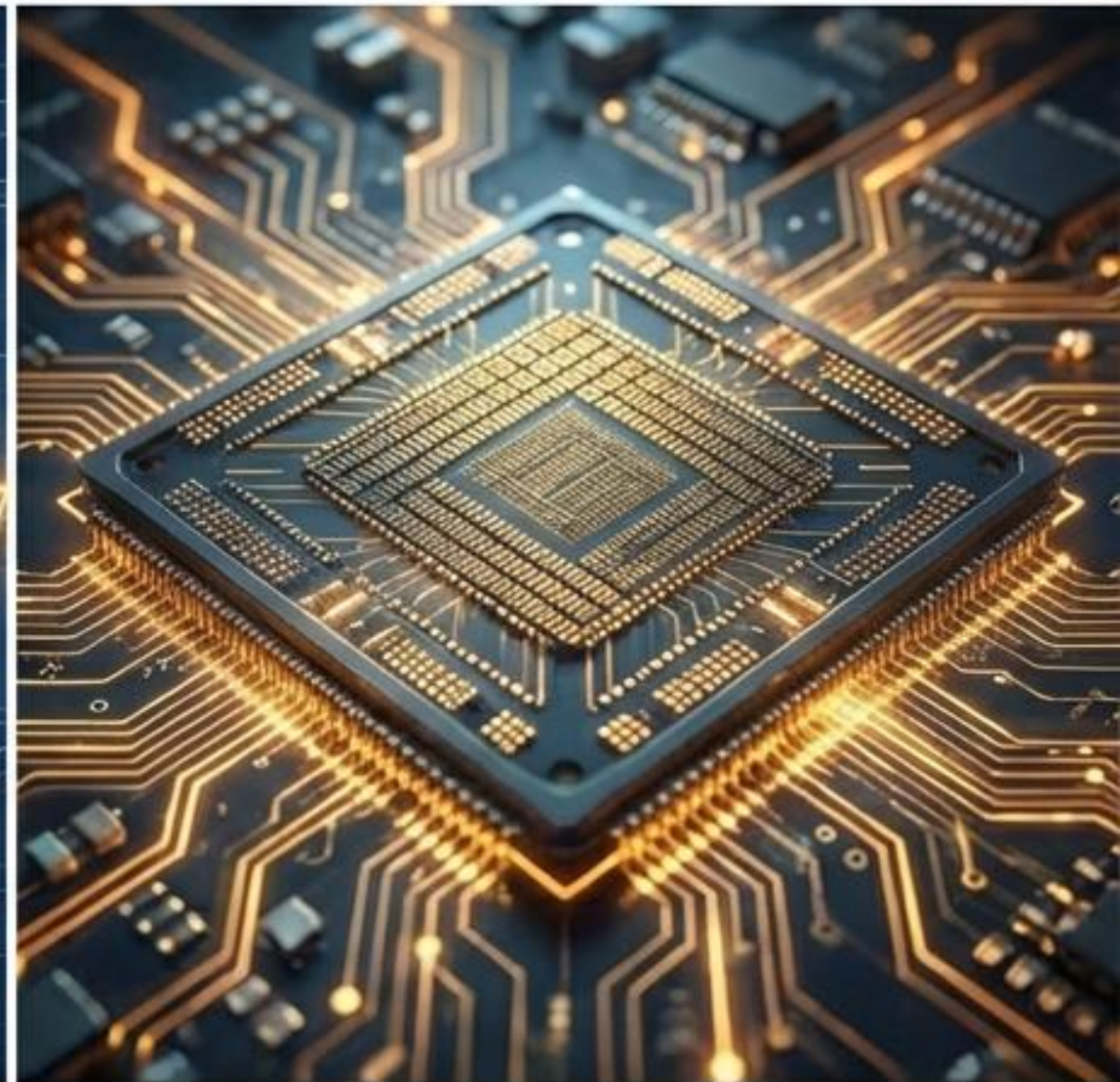
FROM MEASUREMENT TO MODERNITY



MECHANICS
(Forces)



WAVES & NUCLEAR
(Imaging)



ELECTRONICS
(Quantum/Solid State)

Every technology we rely on started as a measurement in a physics lab.



THE BOX IS OPEN



1. Observe Nature
2. Measure with Standards
3. Acknowledge Uncertainty
4. Analyze with Math

The universe is the ultimate mystery box. Go explore it.