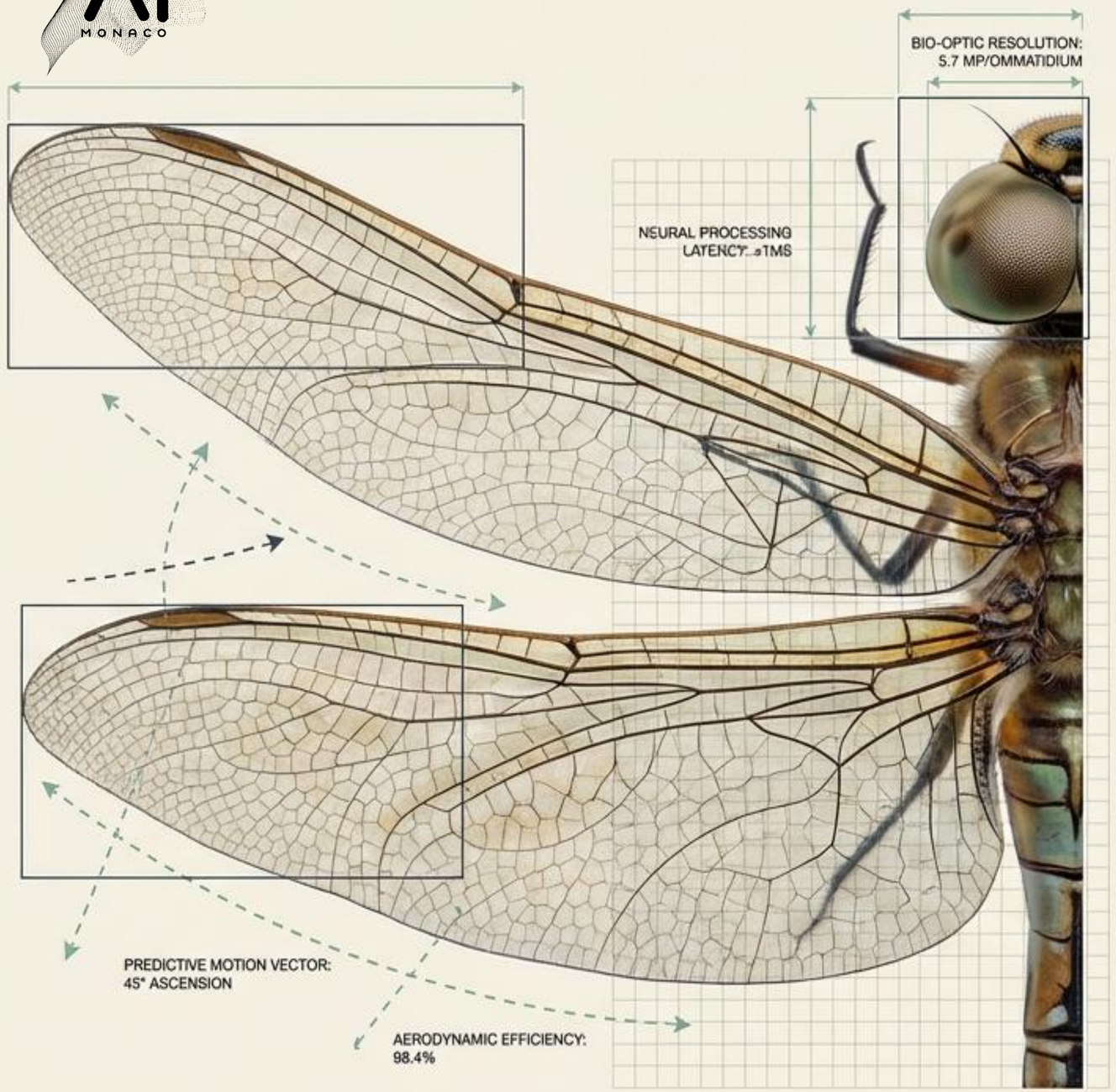
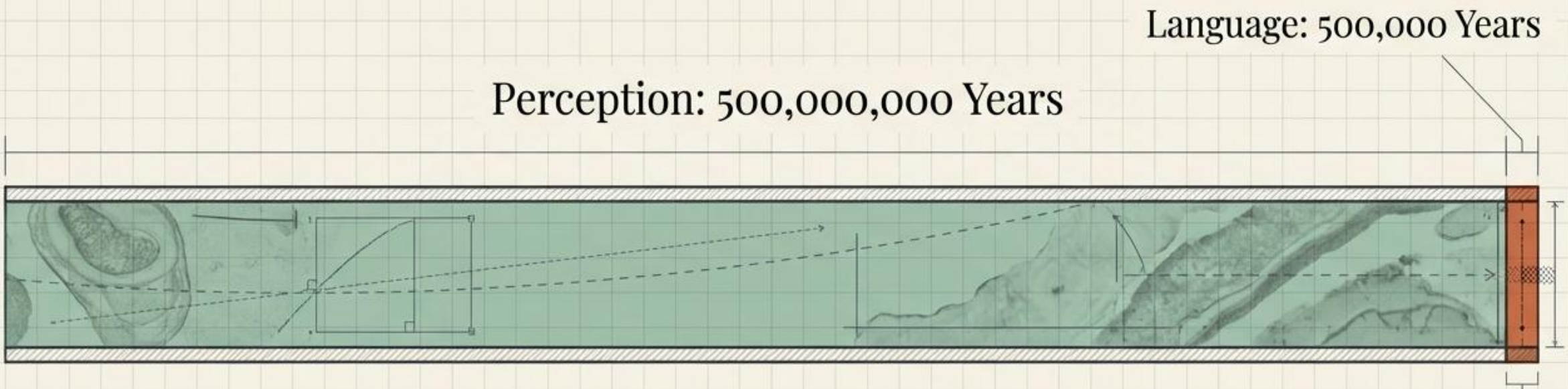
The Deepest Roots of Intelligence Are Physical

Why the next trillion-dollar AI trade relies on predictive world-modeling, not language.



Prepared by AI Monaco | Market Intelligence & Asset Allocation

The Time-Scale of Intelligence

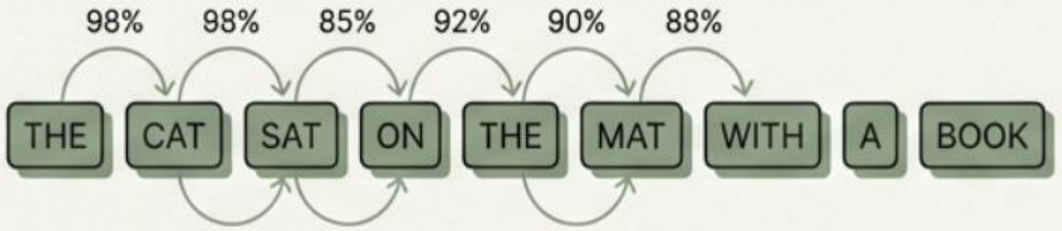


"Language is a half-million-year-old luxury.
Perception is a half-billion-year-old necessity."

— Fei-Fei Li, Professor of Computer Science, Stanford University

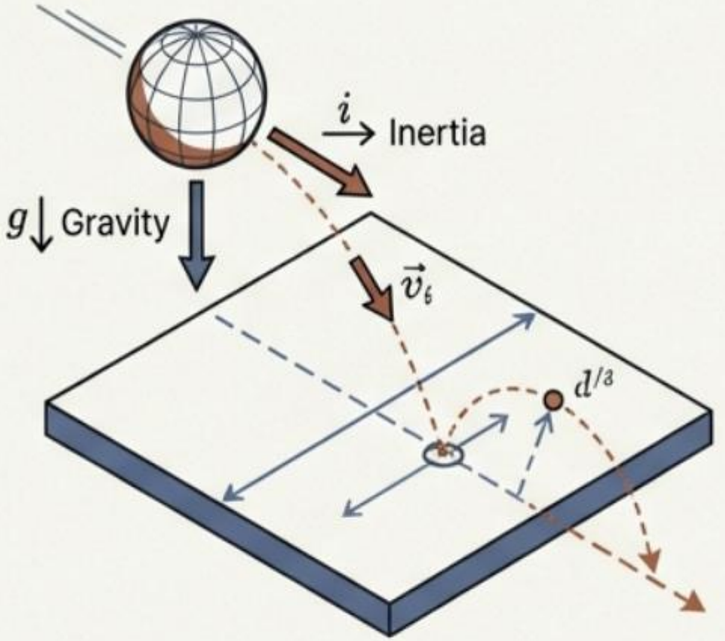
Biological systems evolved to survive in three-dimensional space—anticipating trajectories, forces, and delays long before they could speak.

Artificial intelligence is currently bifurcated



Mastery of Linguistic Symbols

- Large Language Models (LLMs) excel at statistical token prediction.
- Fundamentally detached from physical causality.

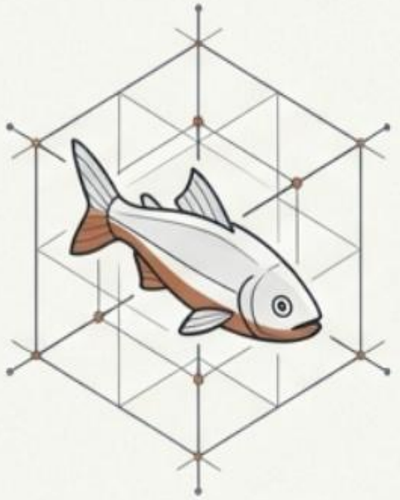


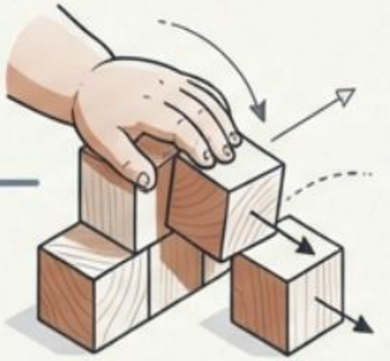
Mastery of Physical States

- Artificial General Intelligence (AGI) requires robust internal simulations of the material world.
- Predicting the 'next state' of a dynamic environment.

Intelligence emerged from navigating a three–dimensional medium

Evolution prioritized the ability to model environmental dynamics—gravity, inertia, and causality—as a prerequisite for survival.



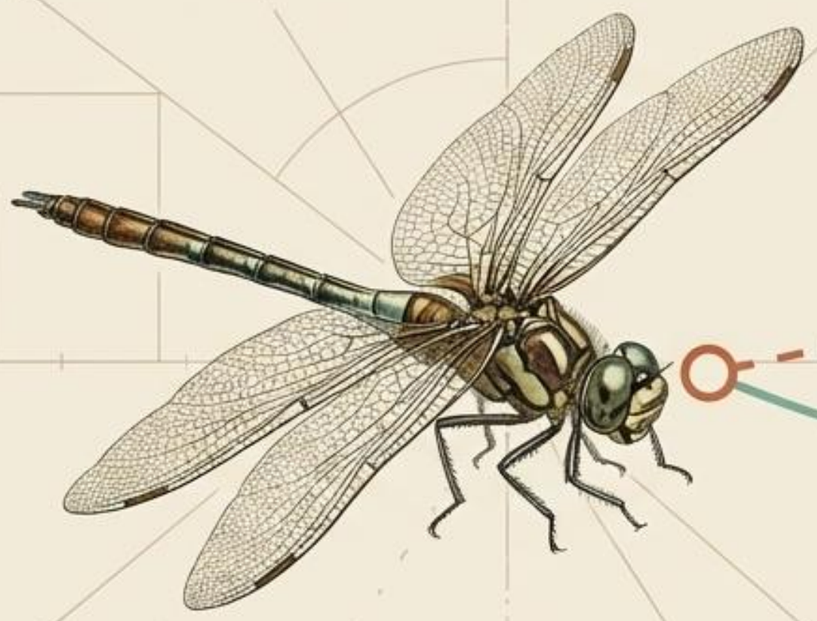


The World Model

- Internal simulation is a universal biological solution to environmental uncertainty.
- Allows agents to predict consequences of actions and trajectories of external agents.

Predictive Control in Apex Predators

95% Hunt Success Rate



Reactive Path: Neural delay guarantees failure.

Predictive Path: Estimating future states.

The Neural Delay: Visual stimulus to motor response creates a lag. Reaction alone is insufficient for survival.

The Solution: Intelligence emerges through estimating future states and updating movement.

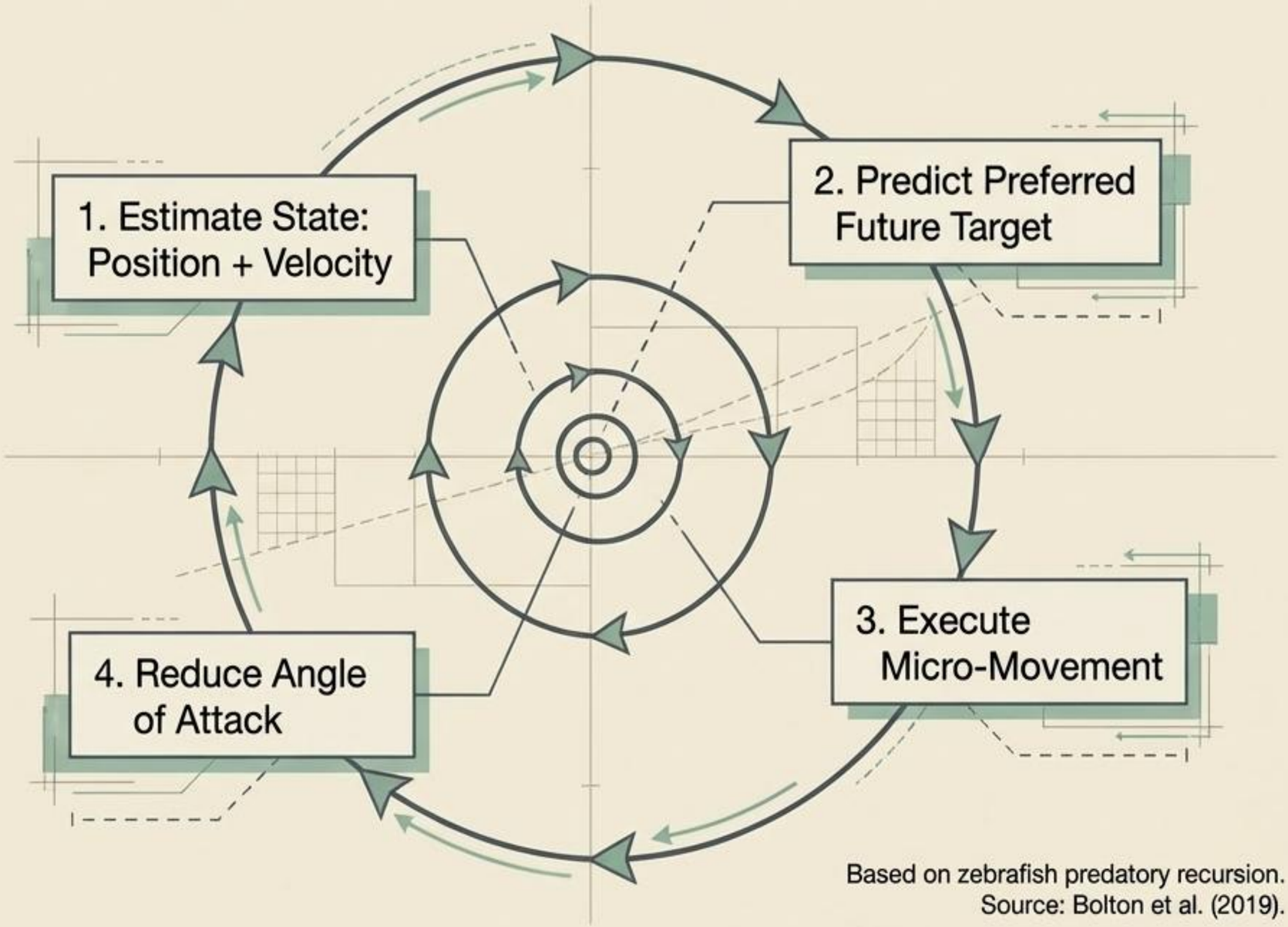
Source: Mischiati et al., *Nature* (2015).

The Architecture of Continuous Adaptation

Core Insight

Intelligence requires systems that track evolving states and adjust behavior based on anticipated futures.

Prediction is not an accessory; it is central.



Based on zebrafish predatory recursion.
Source: Bolton et al. (2019).

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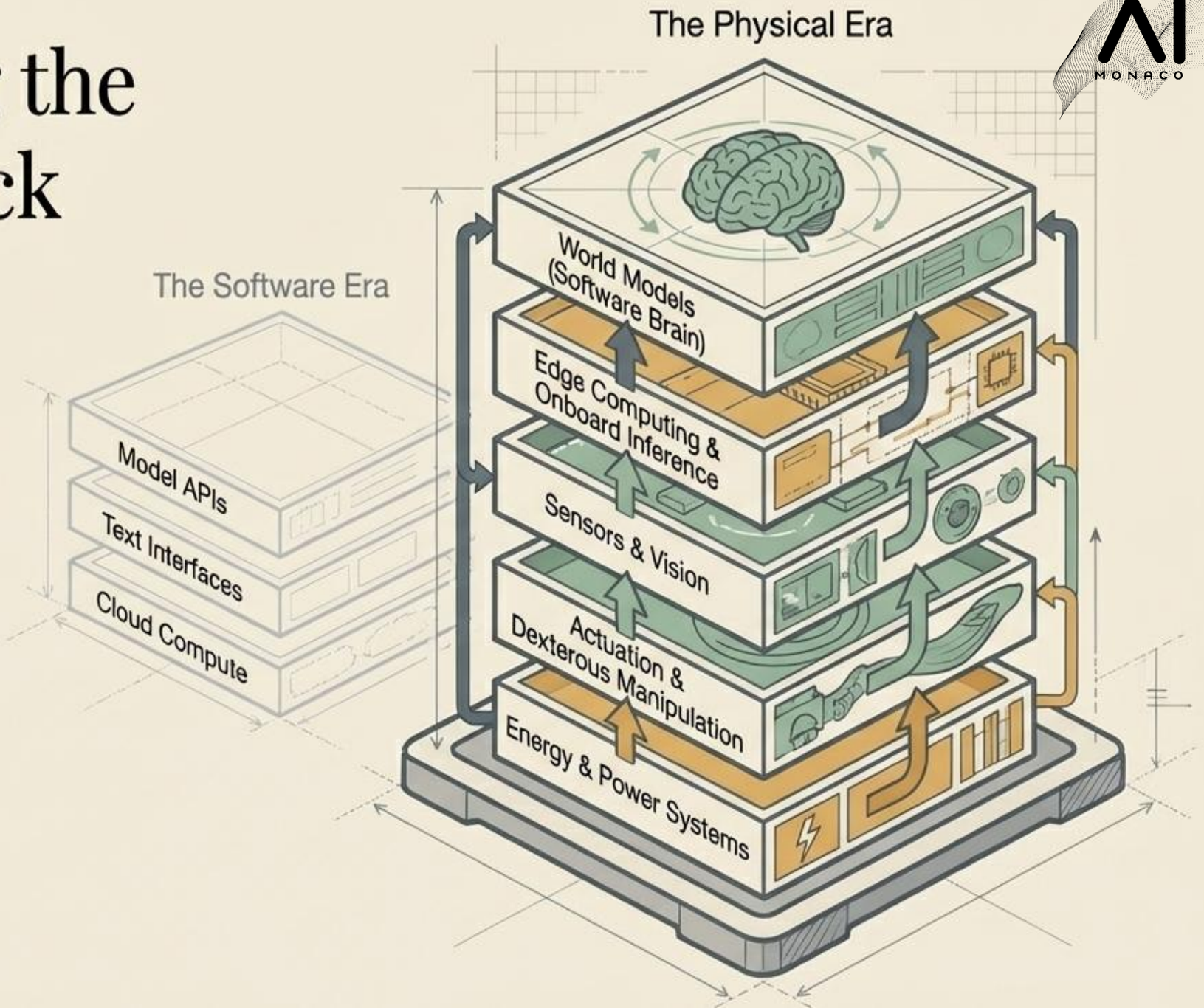
Deconstructing the Physical AI Stack



As software models commoditize, durable economic moats will belong to systems that successfully integrate software with physical sensing, planning, and real-world execution.

The radical transformation of humanoid unit economics

Battery Runtime

1.5 – 2 Hours

→ **8 – 12 Hours (Full Shift)**

Inference Latency

100+ ms

→ **18 – 20 ms**

Unit Cost (Est.)

$250k – $1M

→ **$15k – $30k**

Hand Dexterity

5 – 11 DoF

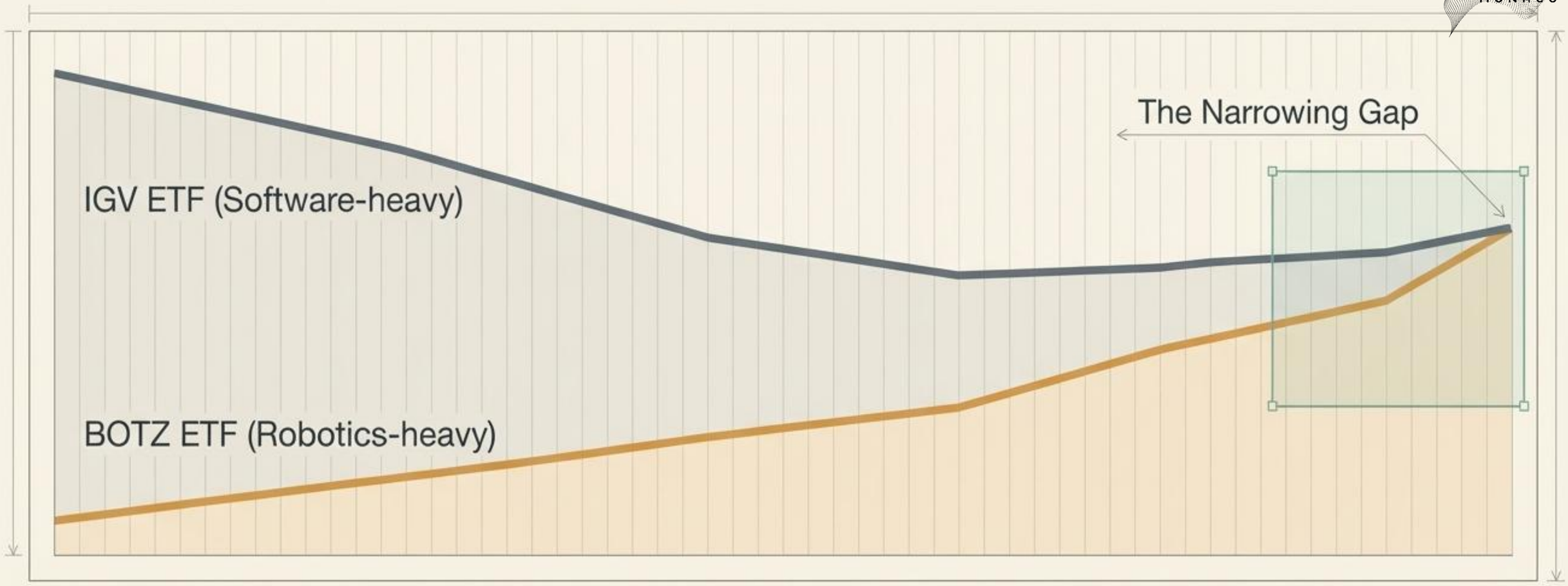
→ **22 DoF (Gen 3)**

Torque Density

Moderate →

High (Solid-State Gears)

The Repricing of AI's Next Frontier



The recent convergence between IGV and BOTZ is not a short-term anomaly. It is an early market signal of a deeper rotation toward the physical AI ecosystem.

The Multi-Trillion Dollar Rotation

Robotics Manufacturers

Sensor Providers

$5 Trillion

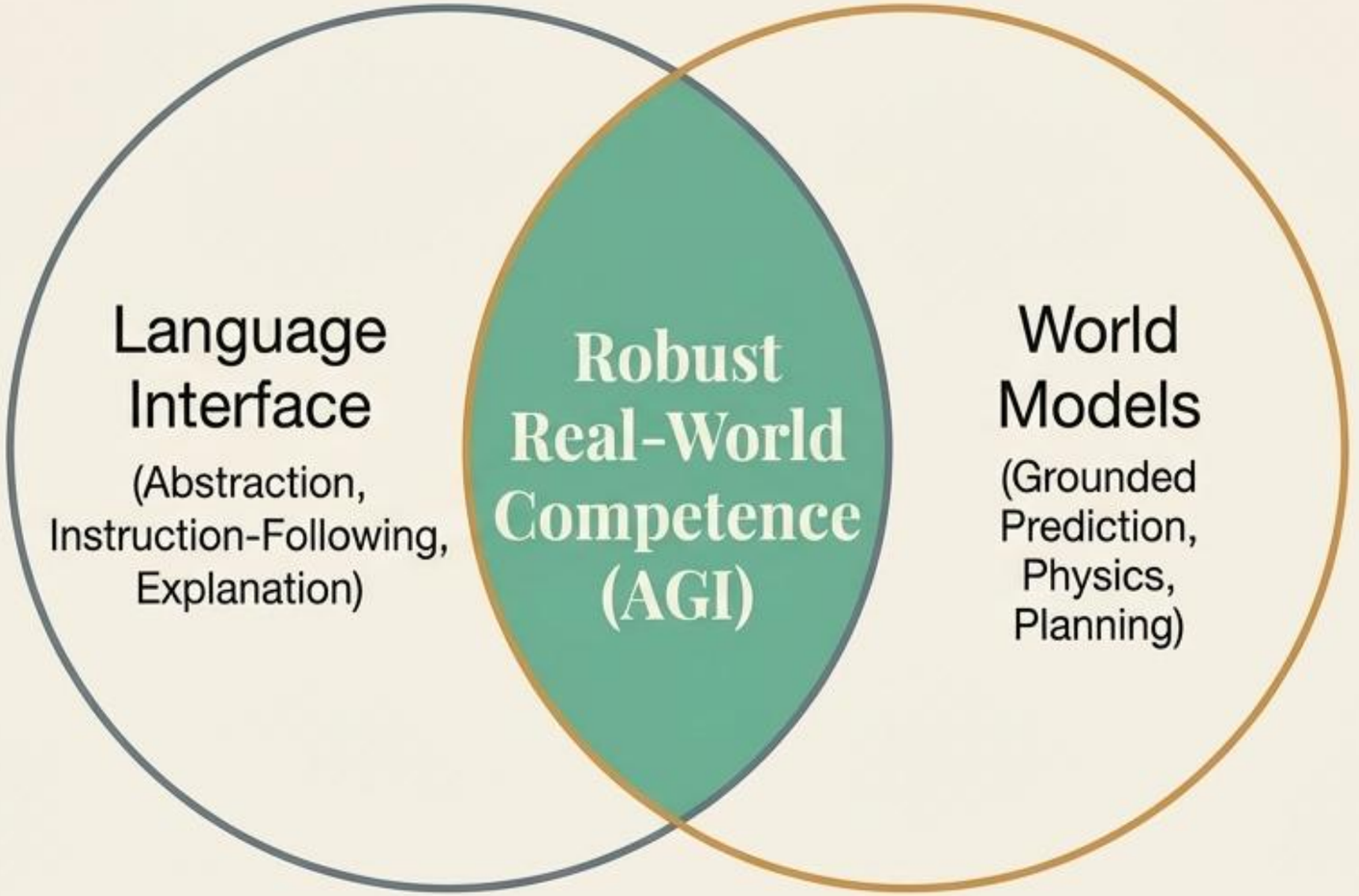
Morgan Stanley Research estimates the embodied AI market opportunity will reach ~US$5 Trillion by 2050.

Semiconductor Suppliers

Edge Inference Enablers

Value is migrating beyond pure software toward the critical infrastructure required for real-world intelligence.

The Ultimate Synthesis



"The most capable systems will look less like a 'bigger language model' and more like a fusion: world models for grounded prediction, with language as the interface layer."

Before intelligence becomes verbal, it is physical. True AI requires both.