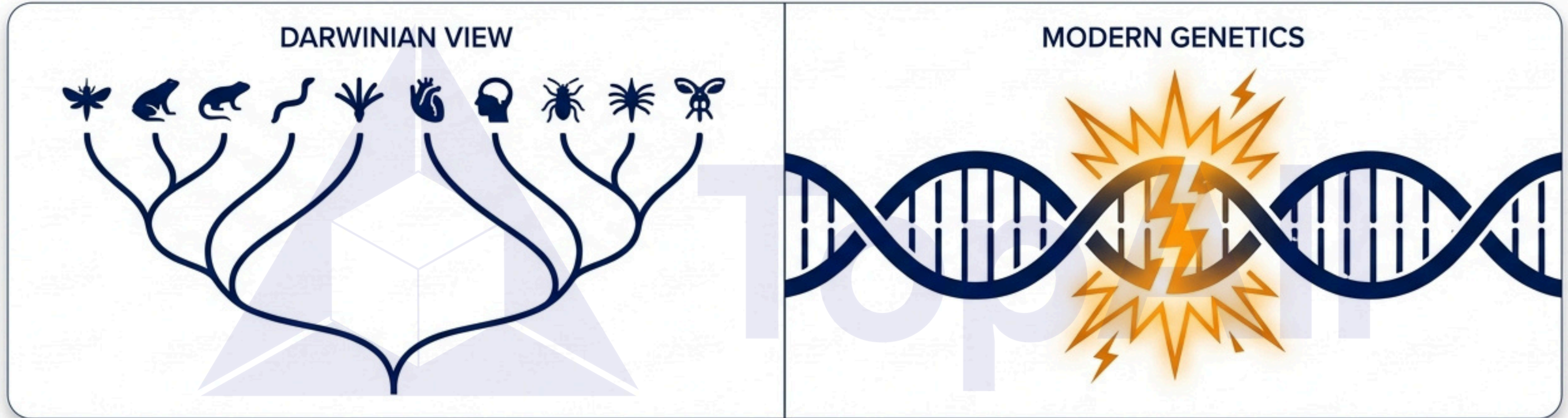


The Search for the Mechanism of Evolution



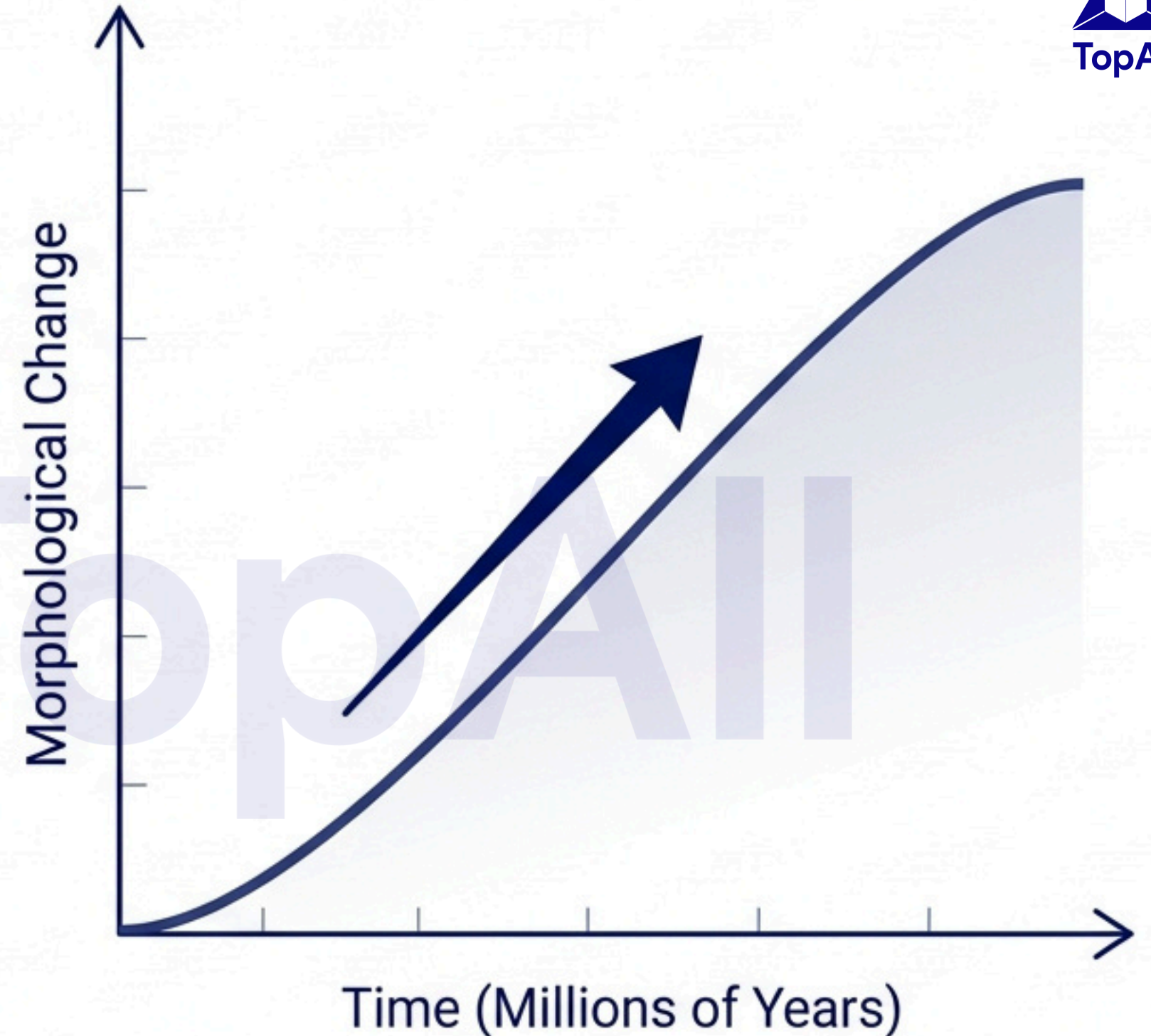
While Charles Darwin successfully established Natural Selection as a mechanism, he remained silent on the actual origin of inheritable variations.

The search for the true engine of genetic variation led to a major shift in evolutionary biology at the dawn of the 20th century.

Darwin Proposed Small, Directional Variations

Darwinian Mechanics

- Variations are minor and small in scale.
- Variations are heritable.
- Variations are directional and gradual (pushed slowly by natural selection over generations).



Note: Darwin believed this gradual accumulation of minor variations was the sole driver of speciation.

Hugo de Vries Looked for the Origin of Variation

The Disruptor: Hugo de Vries

Era: First decade of the 20th century

Based on his work on the evening primrose, de Vries brought forth a radically different idea regarding the mechanism of evolution, challenging the established gradualist view.



Subject: Evening Primrose



Historical Context: While Darwin ignored the origin of variation, de Vries actively sought to discover it through dedicated botanical breeding experiments on the Evening Primrose.



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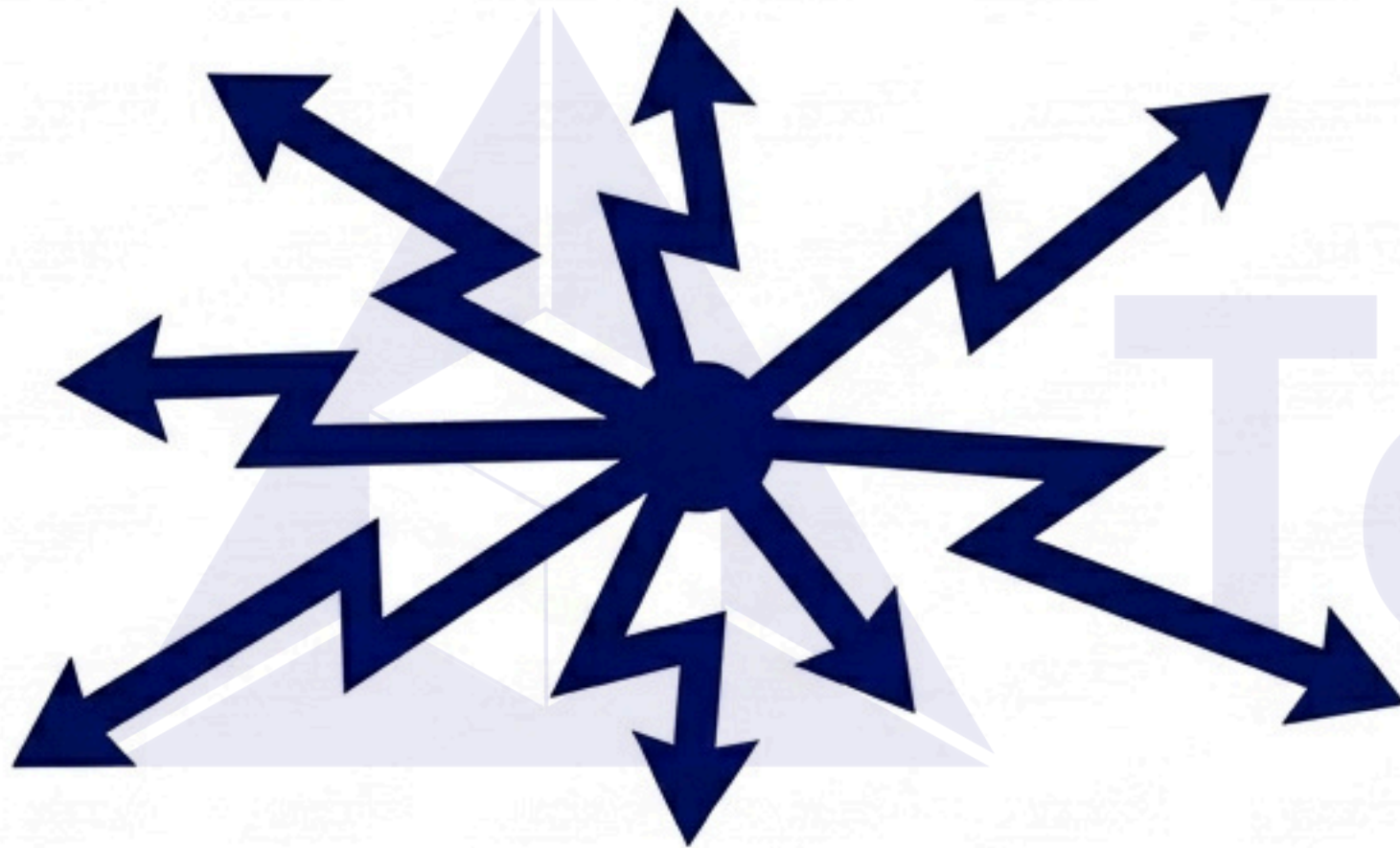
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Mutations are Sudden, Large, and Directionless



Mutation: Large differences arising suddenly in a population.

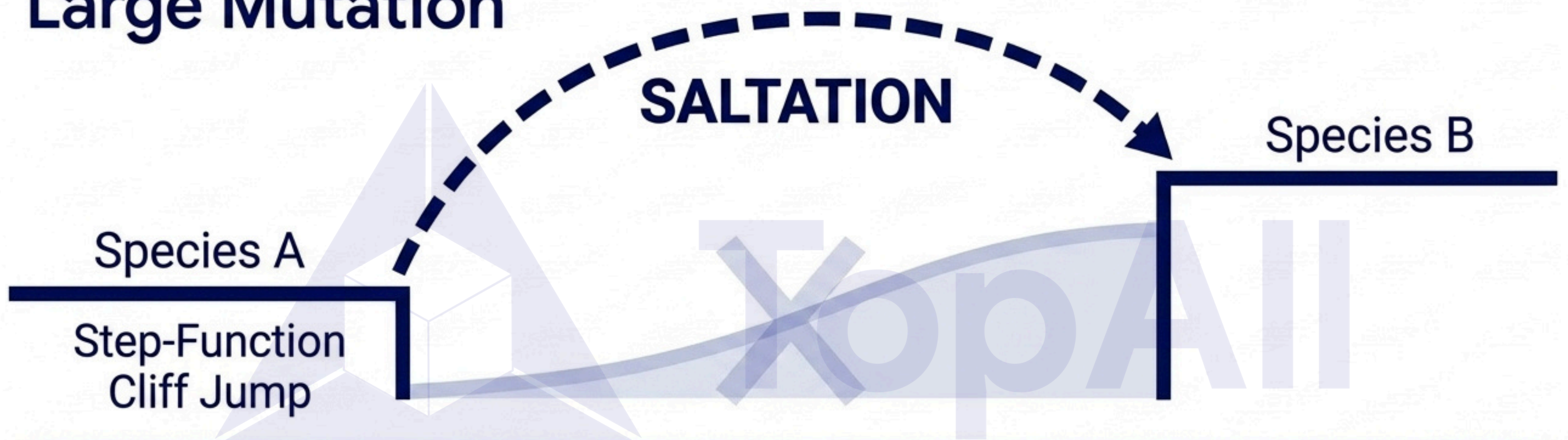
Common Misconception

De Vries' mutations are **NOT** the same as Darwin's minor variations.

He believed that sudden mutations—**not minor heritable variations**—were the true cause of evolution.

Mutations are **random and directionless**, unlike Darwin's directional changes.

Saltation is a Single-Step Large Mutation



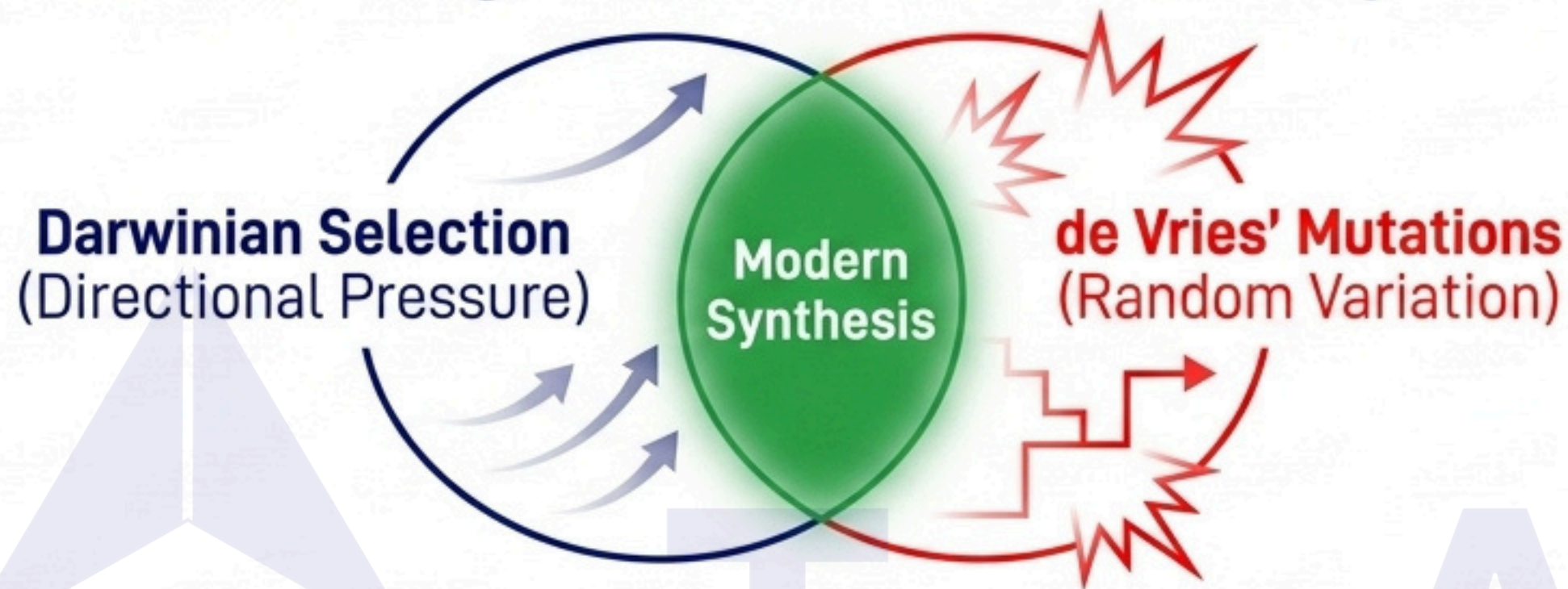
Saltation = Single step large mutation

De Vries believed this **sudden, massive genetic leap** was the **actual engine of speciation**, creating new species instantly in a single generation rather than gradually over millions of years.

Comparing the Two Theories of Evolutionary Mechanics

Feature	Darwinian Evolution	de Vries' Mutation Theory
Speed of Change	Gradual	Sudden
Size of Variation	Small / Minor	Large
Directionality	Directional	Random and Directionless
Engine of Speciation	Natural Selection	Saltation (Single-step large mutation)

Population Genetics Brought the Ultimate Clarity



The Evolutionary Resolution

While Hugo de Vries introduced the critical concept of large, sudden mutations, it was later studies in population genetics that brought ultimate clarity.

Science eventually reconciled both ideas, recognizing that while mutations provide the random raw material of genetic variation, natural selection provides the directional pressure that shapes populations over time.



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