

Stroma

Building Sugar in the Stroma

Transitioning from energy creation to
carbon fixation in the Biosynthetic Phase.



Products of the Light Reaction

From Thylakoid

ATP



The primary energy currency, carrying bond energy synthesized via photophosphorylation.

From Thylakoid

NADPH



The high-energy chemical intermediate providing the reducing power necessary for biosynthesis.

From Thylakoid

O₂



The molecular byproduct generated from the splitting of water at Photosystem II.

The Departure of Oxygen

From Thylakoid

O₂



The molecular byproduct generated from the splitting of water at Photosystem II.

Diffusion

While critical for global aerobic life, O₂ is a waste product of the photosynthetic factory. It

It diffuses out of the chloroplast and ultimately exits the plant into the atmosphere.

STATUS: EXPORTED



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



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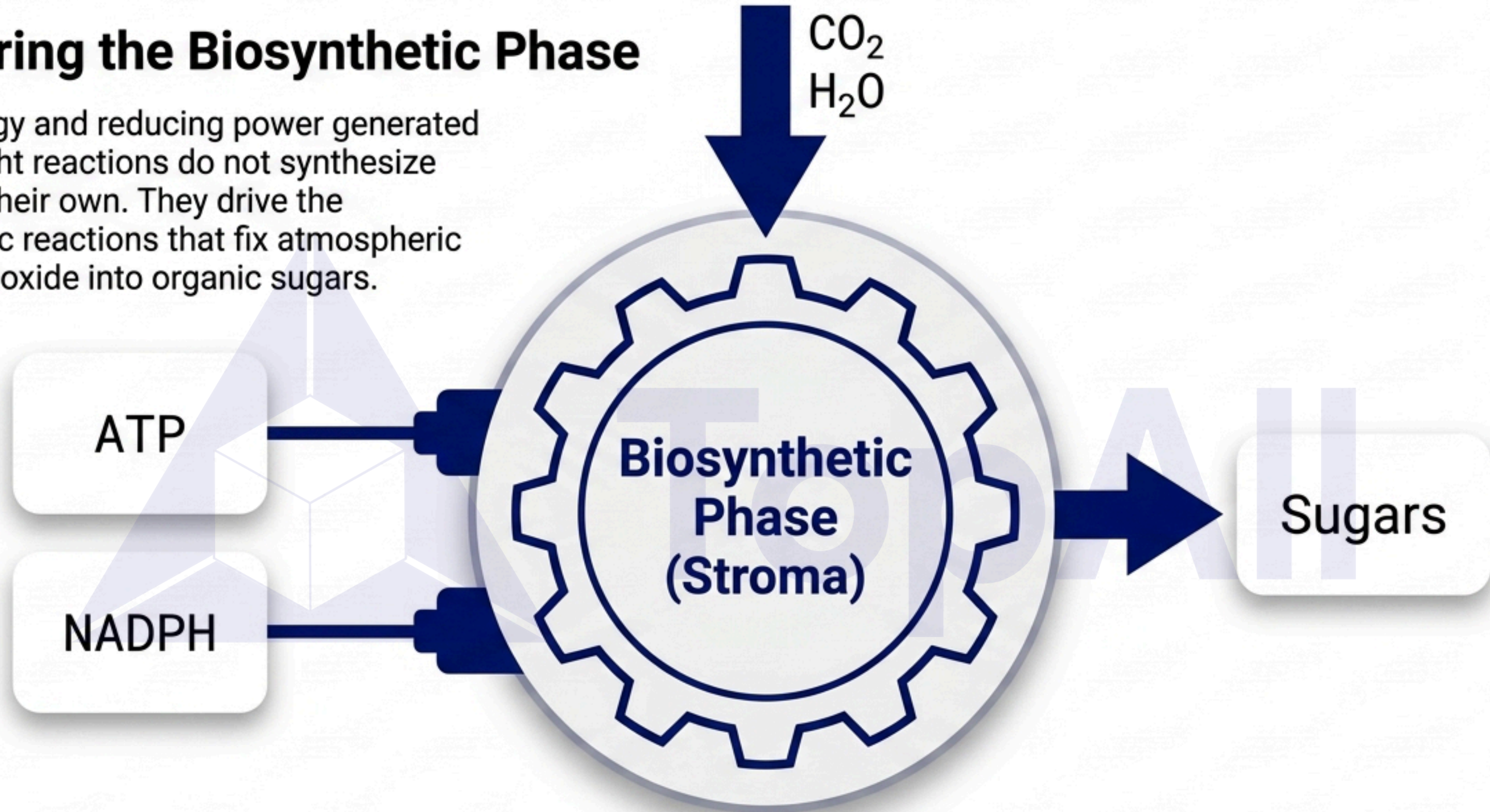
Key Highlights

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Powering the Biosynthetic Phase

The energy and reducing power generated by the light reactions do not synthesize food on their own. They drive the enzymatic reactions that fix atmospheric carbon dioxide into organic sugars.



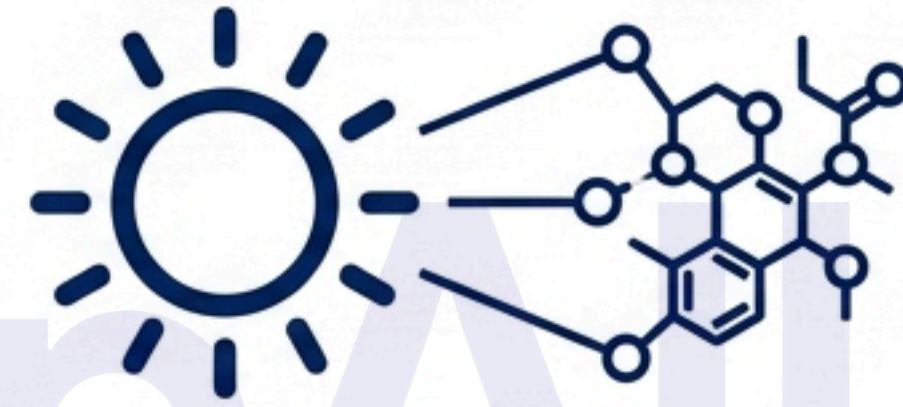
The "Dark Reaction" Misnomer

The "Dark Reaction" Misnomer



The historical term implies this process happens in the dark or is entirely independent of light.

The Biosynthetic Phase



The process is entirely dependent on light-driven products (ATP & NADPH).

Verification Callout

The Proof: If a plant is placed in darkness, biosynthesis continues only briefly before stopping entirely as ATP and NADPH reserves deplete. When light is restored, synthesis immediately resumes.

Tracing the Path of Carbon

Step 1: Isotope Injection



Radioactive Carbon (^{14}C) is introduced to the environment.

Step 2: Algal Photosynthesis



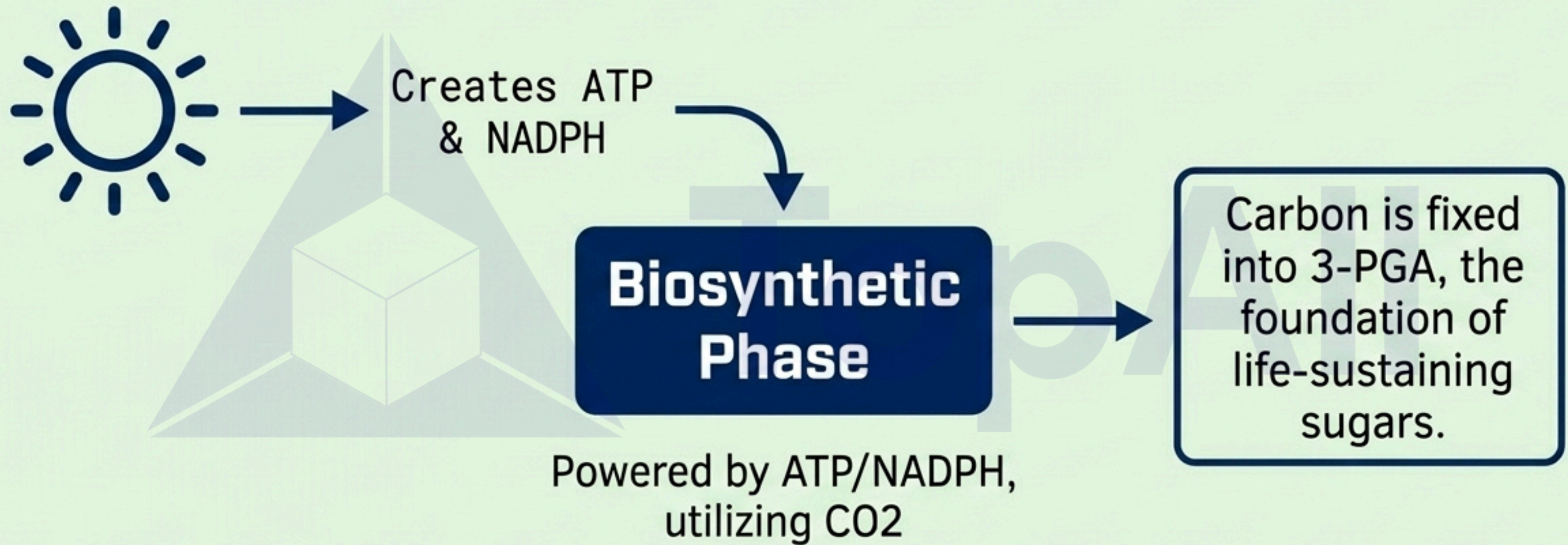
The living algae process the radioactive CO_2 under light.

Step 3: First Stable Product



The ^{14}C is mapped to a 3-carbon organic acid: 3-phosphoglyceric acid (PGA), unlocking the Calvin Cycle.

Key Takeaway: Bridging Light to Life



Melvin Calvin's mapping of this pathway earned the 1961 Nobel Prize, proving exactly how inorganic carbon becomes the organic basis of all autotrophic and heterotrophic life.



You've Learned the Theory.

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