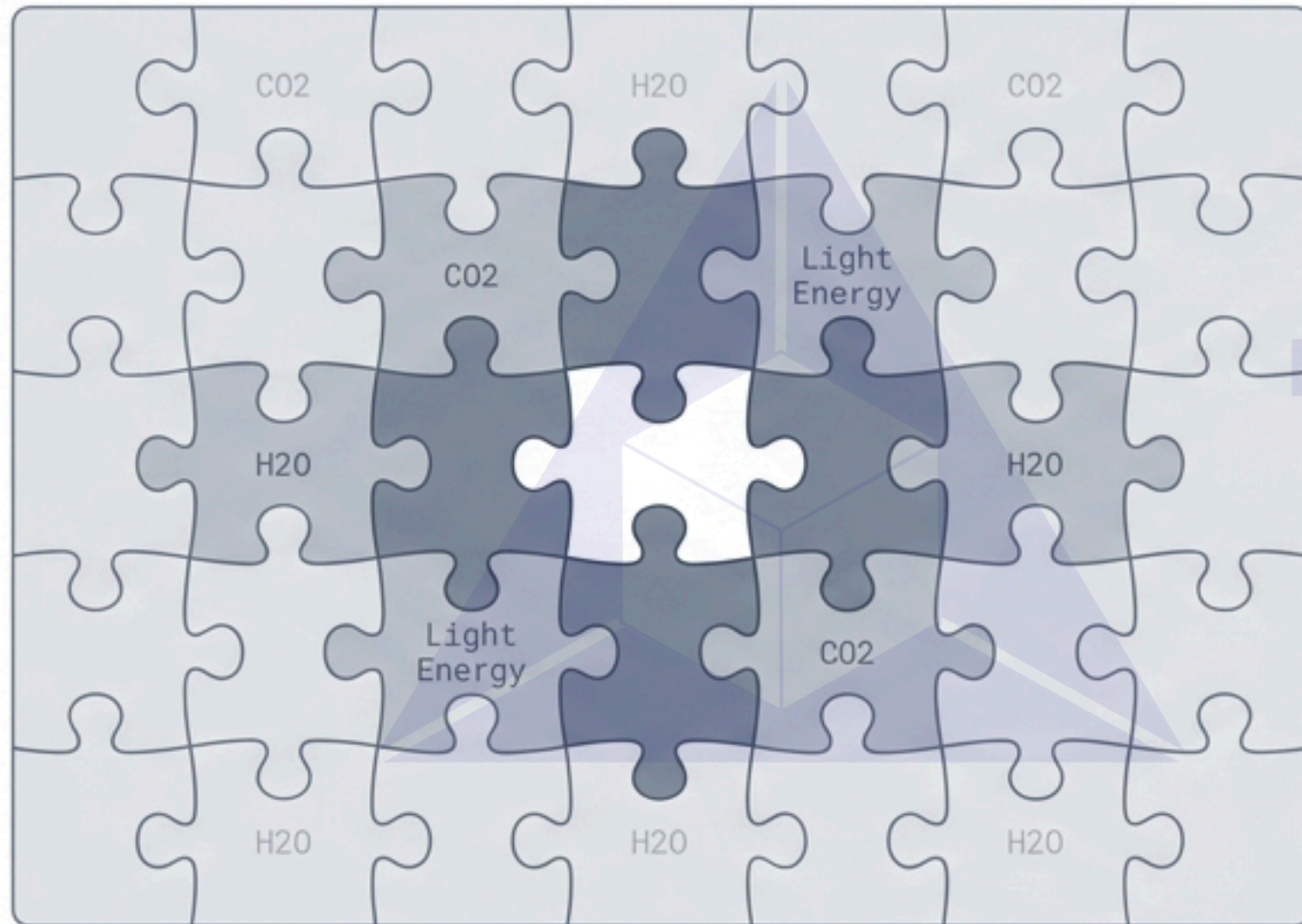


[5C]

RuBP: The 5- 5-Carbon Acceptor

Solving the fundamental mathematical
mystery of the Calvin Cycle.

The Search for the Missing Acceptor



To synthesise food, plants must 'fix' carbon dioxide into stable organic compounds. But what exact molecule inside the plant accepts this CO₂? Finding this missing piece became the ultimate botanical mystery.

Melvin Calvin's Post-WWII Breakthrough

Following WWII, scientists sought beneficial applications for atomic technology.

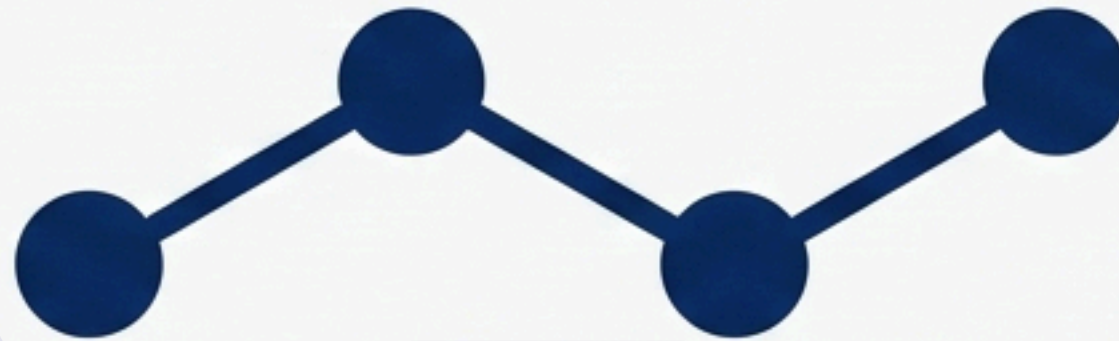


Calvin and his co-workers utilized radioactive ¹⁴C to track the exact pathway of carbon assimilation in algal photosynthesis.



Awarded the 1961 Nobel Prize in Chemistry

Molecular ID Card



[3C]

The First Clue: 3-PGA

3-phosphoglyceric acid

Using the ^{14}C radioactive tracker, Calvin's team made their first major discovery: the very first stable product of CO_2 fixation was an organic acid containing exactly three carbon atoms.

The Setup: If the resulting product has 3 carbons, and the incoming CO_2 has 1 carbon, what was the size of the original acceptor molecule?



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$$E=mc^2$$



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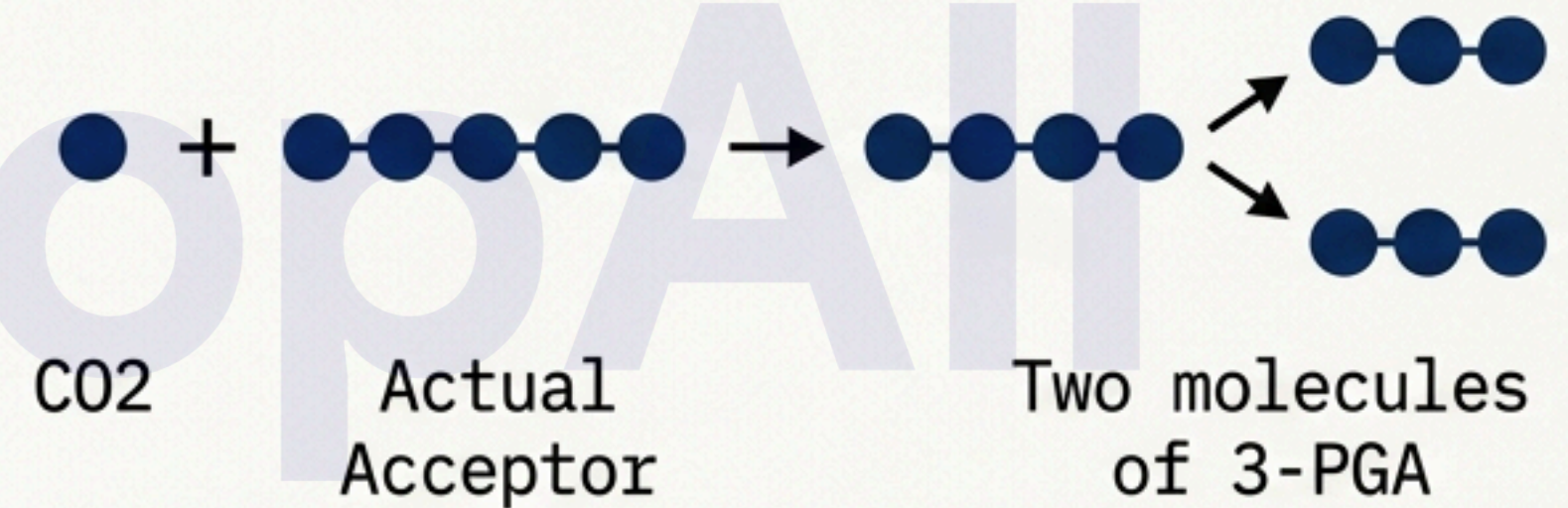


The Logical Assumption



Scientists spent years searching in vain for a 2-carbon compound, assuming a simple 1+2=3 mathematical addition.

The Biological Reality



The startling truth—the acceptor is actually a 5-carbon molecule that temporarily forms an unstable 6-carbon intermediate before immediately splitting in half.

RuBP



ribulose biphosphate

A 5-carbon ketose
sugar base.

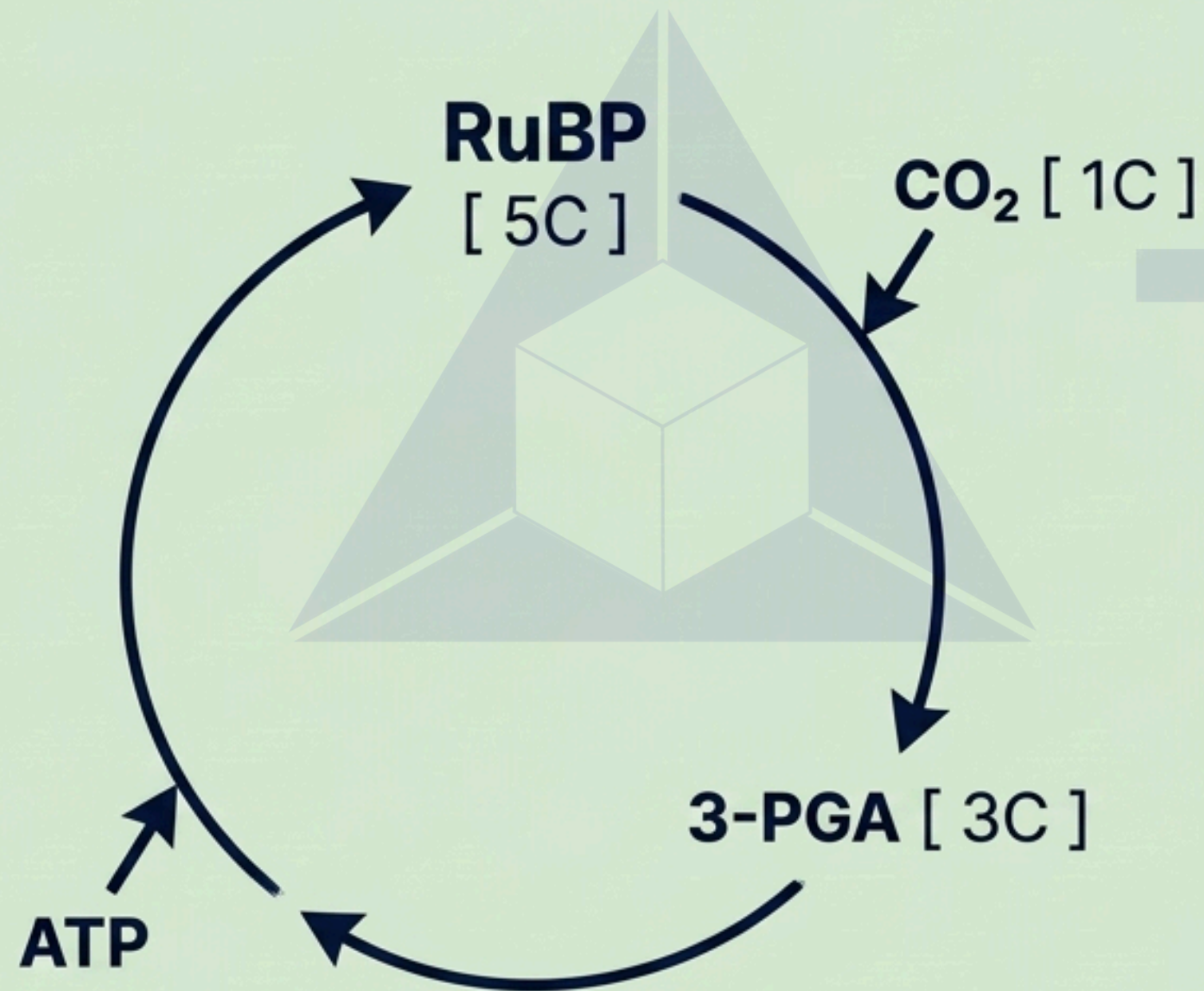
Meaning 'two'.

The functional groups
attached to the ends
of the chain.

Catalysis Note: This vital reaction between RuBP and CO₂ is driven by RuBisCO—the most abundant enzyme on planet Earth.

The Continuous Engine of Life

RuBP acts as the literal and metaphorical starting line of the Calvin Cycle.



1. **Carboxylation** – RuBP accepts the incoming CO₂ molecule.
2. **Reduction** – Energy is utilized to form sugars.
3. **Regeneration** – Crucially, ATP is used to rebuild the 5-carbon RuBP, ensuring the carbon-fixing engine never stops.



You've Learned the Theory.

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