

# What is photosynthesis?

Like my elders and betters, I am often dismayed by what students are told when they ask "What is photosynthesis?" This is what [Howard Gest](#) had to say on the subject

*"When I use a word," Humpty Dumpty said, in rather a scornful tone, "it means just what I choose it to mean--neither more nor less."*

*"The question is," said Alice, "whether you can make words mean so many different things."*

*"The question is," said Humpty Dumpty, "which is to be master--that's all."*

--Lewis Carroll, *Through the Looking Glass*, 1871

Quoted by Howard Gest in [Perspectives in Biology and Medicine](#)

'Evolution of Knowledge Encapsulated in Scientific Definitions'  
[44.4 \(2001\) 556-564](#)

*Kamen (1963) suggested a provisional "rather noncommittal" redefinition: [End Page 561] "Photosynthesis is a series of processes in which electromagnetic energy is converted to chemical free energy which can be used for biosynthesis.*

Kamen, M. D. 1963. *Primary processes in photosynthesis*. New York: Academic Press..

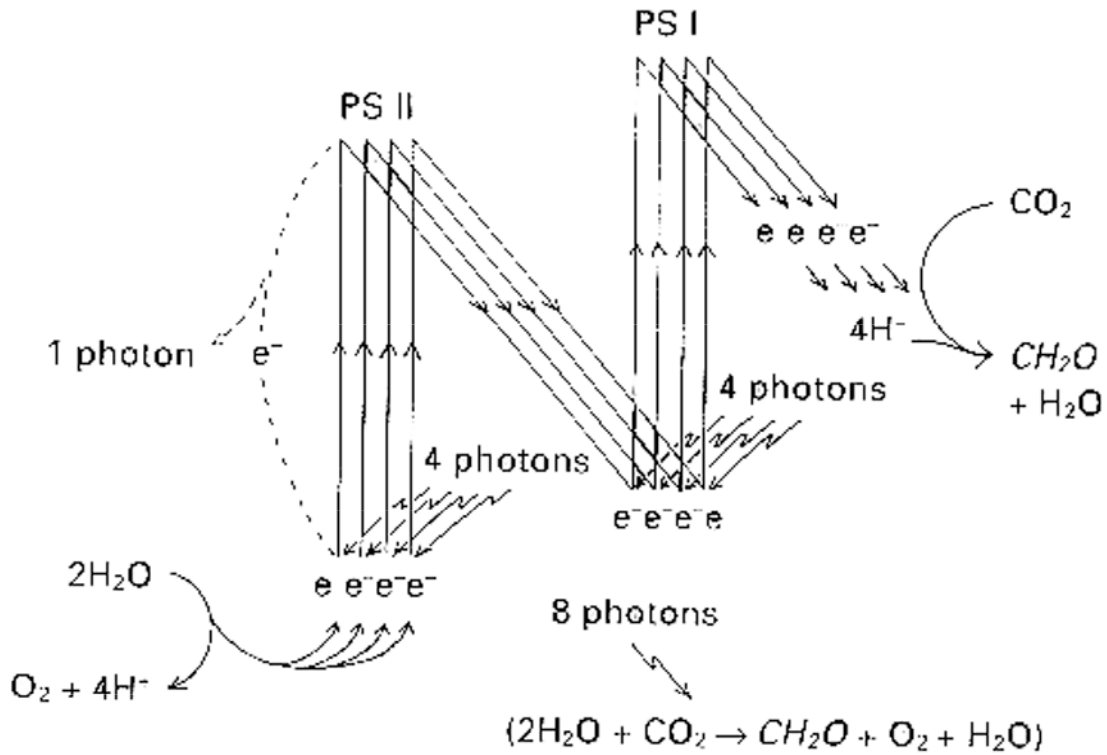
*"Photosynthesis is a series of processes in which electromagnetic energy is converted to chemical energy used for biosynthesis of organic cell materials; a photosynthetic organism is one in which a major fraction of the energy required for cellular syntheses is supplied by light."*

Gest, H. 1993b. Photosynthetic and quasi-photosynthetic bacteria. *FEMS Microbiol. Lett.* 112:1-6.

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Naturally, I couldn't hope to do better than Martin Kamen or Howard Gest but I thought to add a couple of diagrams These are offered in the context of what goes on in such frequently investigated photosynthetic organisms as

*Chlorella* and Spinach. These first is a simplified version of Hill and Bendall's Z-scheme. It shows two photosystems working in unison to move 8 electrons from 2 molecules of water to one molecule of CO<sub>2</sub> (via NADP).



The second diagram is an outline of the Benson-Calvin Cycle. In it, three molecules of CO<sub>2</sub> are "fixed". One molecule of triose phosphate (3) emerges as product and three molecules of pentose phosphate (5) are regenerated.

