

This Week's Citation Classic

Hatch M D & Slack C R. Photosynthetic CO₂-fixation pathways.

Annu. Rev. Plant Physiol. 21:141-62, 1970.

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This article reviewed recent advances in knowledge of the biochemistry and physiology of photosynthetic carbon dioxide assimilation processes. Any unusual popularity of this publication was probably related to the fact that it included the first review of the then novel process for photosynthetic CO₂ assimilation termed the C₄ pathway. [The *SCI*[®] indicates that this paper has been cited over 270 times since 1970.]

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"Chapters on photosynthetic carbon metabolism appear at regular intervals in *Annual Review of Plant Physiology*. The reason we were invited to prepare this contribution on this particular occasion was undoubtedly related to our series of publications in the previous three to four years on the metabolic transformations and enzymes associated with the C₄ pathway. The invitation clearly reflected the 'coming of age' of the C₄ pathway, and a substantial part of the review was devoted to an account of the current status of this process.

"Our first paper on the C₄ pathway, published in 1966,¹ outlined a working model for this process based on ¹⁴CO₂ incorporation studies. In an earlier *Citation Clas-*

*sic*² relating to this 1966 paper, we outlined the interesting circumstances surrounding the discovery and recognition of this process. By the time Slack and I were writing the 1970 review we had resolved much of the basic enzymology of the process. Some progress had also been made towards establishing that the two anatomically distinct types of photosynthetic cells apparent in C₄ plants had quite distinct and separate metabolic functions. Carbon assimilation depended upon a sequence of reaction spanning the two types of cells, and the rapid transfer of metabolites between cells. Meanwhile, the list of so-called C₄ plants grew dramatically, and interest in the relationships between the unique anatomical and physiological and biochemical features of these plants was accelerating.

"The review of these various aspects at that time probably contributed to the rapid expansion of research effort on C₄ pathway plants in the early part of the next decade. This period saw evidence for three metabolically distinct types of C₄ plants, distinguished on the basis of differing C₄ acid decarboxylating mechanisms, as well as a clarification of the physiological advantages offered by the C₄ pathway. The intra- and intercellular location of key enzymes was also completely defined. The operation of the C₄ pathway now has wide implications in areas as varied as taxonomy, plant performance and productivity, and ecology."

1. Hatch M D & Slack C R. Photosynthesis by sugar-cane leaves. A new carboxylation reaction and the pathway of sugar formation. *Biochemical J.* 101:103-11, 1966.
2. Hatch M D. Citation Classic. *Current Contents/Agriculture, Biology & Environmental Sciences* (39):22, 29 September 1980.