

Öpik H. Changes in cell fine structure in the cotyledons of *Phaseolus vulgaris* L. during germination. *J. Exp. Bot.* 17:427-39, 1966.
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This paper gives a comprehensive account of the fine structure of *Phaseolus vulgaris* cotyledons from the beginning of germination to cotyledon senescence in eight days at 25°C. The ultrastructural changes are discussed in relation to the development of physiological activity in the cotyledons. [The SCI® indicates that this paper has been cited in over 120 publications since 1966.]

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October 24, 1982

"When I first took up an appointment as lecturer at the University College of Swansea in 1961, I regarded myself as a plant physiologist with biochemical leanings, having just completed my PhD on respiration and mitochondrial metabolism in germinating bean cotyledons. I was continuing research along the same lines when the head of the department, H.E. Street, called me into his office. The college was investing in a high resolution electron microscope, and he thought that one of his staff should learn how to use it: would I consider examining my bean mitochondria by electron microscopy? This sounded interesting, so I said yes, I would have a go.

"Now that the electron microscope has become a routine tool in numerous disciplines, it may be difficult to imagine the impact and the excitement caused by the arrival of a high-powered electron microscope

in the early-1960s. I shall never forget the thrill of the moment when I slid my first specimen grid into the microscope column and watched appear on the screen—cells, with recognizable organelles! I did not realize it immediately, but I was hooked on electron microscopy, for good—although if the professor had seen the dance of triumph that I executed around the microscope, he might have had doubts about letting me proceed.... I was hooked because I thought the cells looked beautiful. I still do.

"My original brief had been to look for changes in mitochondrial structure, with the hope of being able to relate such changes to my previously measured variations in mitochondrial activity during germination. Soon, however, I became fascinated by the structure of the cells in general. Botanical studies of ultrastructure were then not yet too common; the first detailed full-length text on plant cell ultrastructure appeared only in 1968.¹ As I examined material of successive ages, I saw a sequence of structural changes unfolding before my eyes. That developmental sequence became the subject matter of this paper; and being a physiologist by training, I still sought to interpret the structural changes in terms of physiological activity—to correlate structure with function.

"I believe that this paper has become a *Citation Classic* because it presents a comprehensive account of cell fine structure in the cotyledon tissues from seed imbibition to senescence. Leguminous cotyledons have subsequently been subject to many investigations of specific aspects of their physiology and ultrastructure, and my paper has apparently formed a convenient reference frame for more detailed studies.² In work on seed physiology, references are frequently made to fine structure.³

"The difficulties I encountered were technical: I embarked on electron microscopy in a department where it had not been done before, and at a time when techniques of biological specimen preparation were still advancing rapidly. But it was very stimulating to work in a fast-expanding field."

1. Clowes F A L & Juniper B E. *Plant cells*. Oxford: Blackwell Scientific, 1968. 546 p.
2. Barber R F & Thompson J E. Senescence-dependent increase in the permeability of liposomes prepared from bean cotyledon membranes. *J. Exp. Bot.* 31:1305-13, 1980.
3. Bewley J D & Black M. *Physiology and biochemistry of seeds in relation to germination*. Berlin: Springer-Verlag, 1978. Vol. 1.